march 1958

nlgi spokesman

journal of the national lubricating grease institute

"In 14 months...not a single bearing lubrication failure with lithium-base grease!"

Conveyor-stacker handling moist, sticky material which builds up on the rollers.

Ore unloading conveyor rollers handling 200 tons of ore per hour.

Pinion gear transmitting power from 600 h.p. motor to a ball mill.

Pan Conveyor handling hot clinker (1600°F), roller bearings in dusty, moist atmosphere.

Leach tanks handling hot slurry, agitators driven by Falk gear reducing units.

V.A. Wemco classifier, part of wet grinding system, lower bearing submerged in hot sludge.

THE PROOF IS IN THE PERFORMANCE...

lithium-base grease does the job...

and does it better!

Here's a report of our own experience with lithium-base grease under extreme industrial service conditions. Approximately 95% of the grease used in the plant of AMERICAN LITHIUM CHEMICALS, Inc., our subsidiary at San Antonio, Texas, is lithium-base, one-type grease. In fourteen months operation we have not been able to trace a single cause for bearing failure to the lubricant used. The on-the-spot photos above give graphic evidence of the rugged bearing service requirements in this plant where lithium ores are processed into high-grade lithium hydroxide, itself an important ingredient in lithium-base grease. Performance like this is why grease chemists, manufacturers, marketers and users all attest to the superiority of lithium-base... the *one* grease in place of *many* for efficient and economical operation.

TRONA
REG. U.S. PAT. OFF.

Want to know more about TRONA lithium hydroxide monohydrate? Send for our technical bulletin on this important chemical ingredient in lithium-base greases.

American Potash & Chemical Corporation

3030 West Sixth Street • Los Angeles 54, California

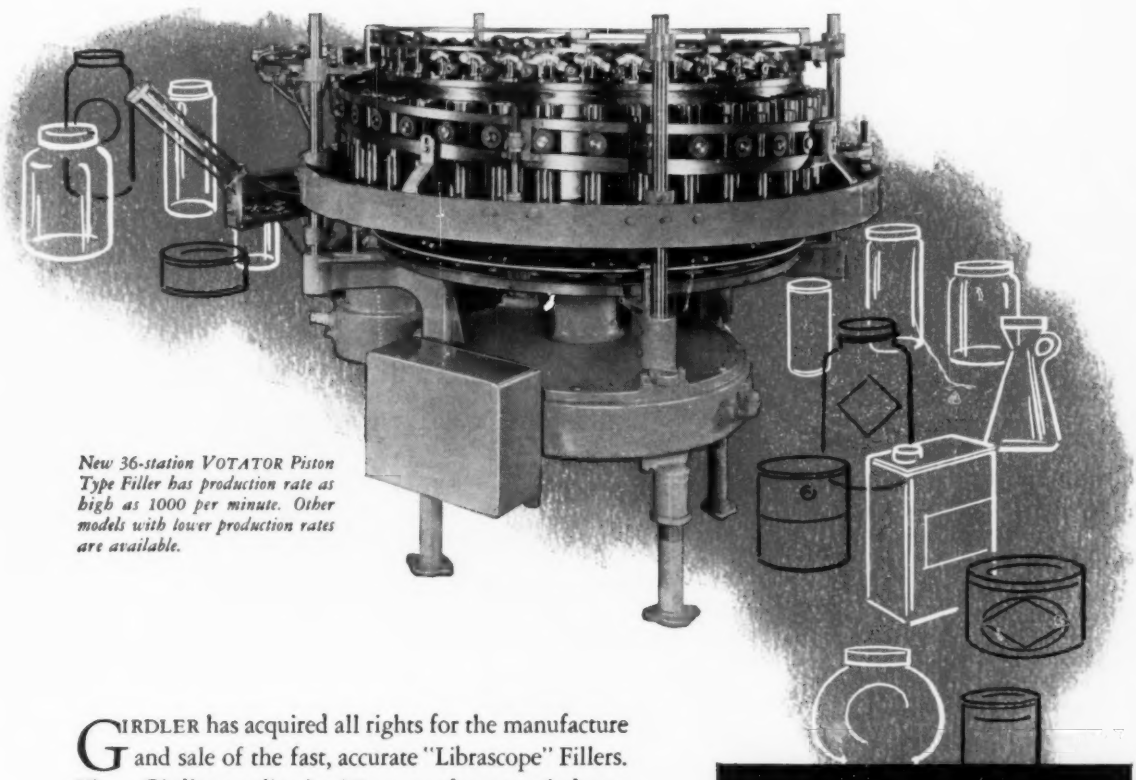
LOS ANGELES • NEW YORK • SAN FRANCISCO • ATLANTA • PORTLAND (ORE.)

Export Division: 99 Park Avenue, New York 16, New York

member of...

ANNOUNCING THE NEW VOTATOR FILLER

for continuous, high-speed, accurate packaging



New 36-station VOTATOR Piston Type Filler has production rate as high as 1000 per minute. Other models with lower production rates are available.

GIRDLER has acquired all rights for the manufacture and sale of the fast, accurate "Librascope" Fillers. Thus, Girdler applies its 30 years of process industry experience and its precision-production facilities to bring you high standards of packaging economy.

By adding this new line of VOTATOR Fillers to its line of VOTATOR* Heat Transfer Apparatus, Girdler affords many manufacturers a closer integration of processing and packaging operations.

The new VOTATOR Fillers have distinctive improvements for more profitable packaging of many liquid and viscous products. They are fully described in Bulletin PED 257, free on request.

*VOTATOR—Trade-Mark Reg. U.S. Pat. Off.

GIRDLER

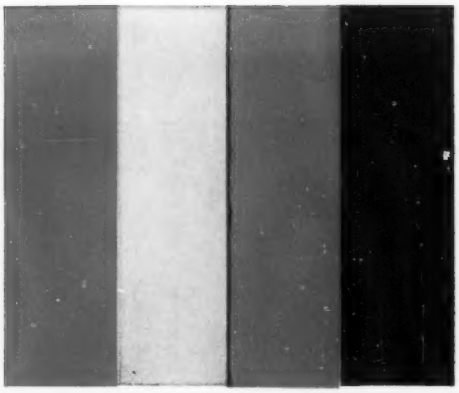
PROCESS EQUIPMENT DIVISION

NATIONAL CYLINDER GAS COMPANY

Louisville 1, Kentucky

Manufacturers of VOTATOR and THERMEX Processing Apparatus

Sales Offices: Louisville, New York, Chicago, Atlanta, San Francisco



News About NLGI

Waverly Oil Works Joins NLGI

The Waverly Oil Works company of Pittsburgh, Pa., has joined NLGI as an Active (manufacturing) member. This affiliation is the third new member firm for the Institute since the first of the year . . . Maruzen Oil of U. S. A. and Battenfeld of New York are two other Active firms joining in 1958.

A profile on Waverly will be presented in a later issue of the NLGI SPOKESMAN. Representing the organization as NLGI Company Representative will be the company's secretary-treasurer, S. M. Vockel, Jr.

Moving Picture Put to Many Uses by Owners

The national office is pleased to report that more than 60 prints of the NLGI movie "Grease–the Magic Film" have been distributed –an excellent showing in the first six months that the picture has been available.

Subsidized in part by the Institute, the 16mm sound film in color is being put to a number of uses by member firms, including customer relations, dealer training, and public relations activities. First shown to the public at the Annual Meeting in Chicago last October, "Grease–the Magic Film" viewing requests from non-print owners are first referred to that member firm geographically closest to the organization desiring the showing.

At this writing, two NLGI overseas member firms are previewing national office copies of the movie, to ascertain whether the film will apply to their operations. Special foreign language adaptations are also available through magnetic strip versions.

Swiss Member Extends Invitation to NLGI'ers

A recent letter from Mr. Hermann P. W. Wanner, managing director of Adolf Schmids Erben, Inc., the NLGI Active member firm of Berne, Switzerland, was received by President R. Cubicciotti. In the correspondence Mr. Wanner made a particular point of inviting Company and Technical representatives of NLGI companies to visit the Swiss operation. The letter said in part:

Although the great distance prevents us from active participation in all the various NLGI activities we nevertheless appreciate very highly this membership and the many friendly contacts by mail with many NGLI members which it has brought us.

I hope to be able to make another visit to the States in the not all too distant future, and I do hope also the NLGI members visiting Europe will not omit including Switzerland and Berne in their itinerary–they will not regret it.

Mr. Wanner last visited the United States eight years ago, when he attended the 1950 NLGI annual meeting in Chicago.

SPOKESMAN Microfilms Will Include Entire Set

The entire collection of NLGI SPOKESMAN bound volumes will soon be microfilmed by University Microfilms, Ann Arbor, Michigan. Heretofore, only copies from Volume XIV had been reproduced in this fashion.

Contained on rolls of film measuring three and three-quarters inches in circumference, the entire volume is committed in this fashion and is readily available for reference. Cost per roll is $1.80, from University Microfilms.

Changes in Representation

The Elco Lubricant corporation has named R. K. Smith as NLGI Company Representative. Smith is the new sales manager for this Associate member firm.

Lithium Corporation of America has named Mr. Malcolm M. Moore as the Company Representative of this NLGI Associate member firm. Mr. Walter M. Fenton, vice president of product research and development, will continue as the Technical Representative.

Survey Reminders Sent

As a courteous reminder to U. S. Active member firms about the deadline, a general mailing to *all* manufacturers will be sent by the gathering agency, concerning the NLGI production survey. The closing date is March 31, 1958.

Better Water-Resistant Greases With ADM's Hydrofol AB Acid

Many grease manufacturers have discovered how ADM Hydrofol AB Acid improves their water-resistant sodium and aluminum-based greases. The reason is that Hydrofol AB Acid is a combination of fatty acids with chain lengths ranging from C-14 to C-22. The C-20 and C-22 acids (arachidic and behenic) make up more than half of the total mixture.

This blend gives a far different structure than acids dominantly of one chain length. Hydrofol AB Acid gives you a mixture of desirable characteristics, with improved solubility plus really remarkable water repellency. Manufacturers of greases for water pumps, springs, wheel bearings, chassis, steering mechanisms, ball or roller bearings, and other places where water resistance is essential have turned to Hydrofol AB Acid to solve their problems.

These ame manufacturers have learned to rely on ADM's leadership, reputation, and consistent quality. If you somehow have missed doing business with ADM, chances are you have a pleasant treat ahead of you. Find out for yourself why so many people in the grease industry order their fatty acids from ADM. And, for your future reference, here are the specifications for Hydrofol AB Acid:

SPECIFICATIONS

Titer	60-63 °C
Acid Value	178-185
Iodine Value	5 Max
Saponification Value	179-186
Spec Grav 100/20°C (av)	0.828
Color 5¼" Lovibond	25Y-2.5R
Calculated Molecular Wt.	302-314

ADM PRODUCTS: Linseed, Soybean and Marine Oils, Synthetic and Natural Resins, Fatty Acids and Alcohols, Vinyl Plasticizers, Hydrogenated Glycerides, Sperm Oil, Foundry Binders, Bentonite, Industrial Cereal, Vegetable Proteins, Wheat Flour, Dehydrated Alfalfa, Livestock and Poultry Feeds.

Archer-Daniels-Midland

CHEMICAL PRODUCTS DIVISION
741 Investors Building
Minneapolis 2, Minnesota

Chemifats from Nature's Wondrous Warehouse

NLGI PRESIDENT'S PAGE

By R. CUBICCIOTTI, *President*

Survey Success Depends on You!

By the time this issue of the NLGI SPOKESMAN appears, all members of the National Grease Lubricating Institute should have received their questionnaire for the survey by which we hope to establish the trend in lubricating grease production.

It would be superfluous to remind the members how important their co-operation is to the success of our undertaking, or how vital that success is, not only to our industry and industry in general, but also to our government.

What is just as important and should perhaps be more strongly emphasized is the fact that we are setting an important example. For our survey is a working demonstration of how members in a highly competitive industry can cooperate to realize an objective that would have the greatest benefit for the common good.

The stated aim of the survey is to establish production trends and to give a proper perspective and adequately project future developments in the lubricating grease industry—thereby aiding suppliers of raw materials and containers.

By achieving this aim—and, in view of the overwhelming response of our members to the invitation to participate in the survey, this seems to be assured—we actually will accomplish far more. We will have opened a wider vista—a vast, untapped potential for future activity through increased industry-wide co-operation.

Since the survey may be the forerunner of even more extensive undertakings by our group, what we do in the future will depend to a great extent on the success of the project at hand. It, therefore, seems appropriate now to emphasize that every member should participate to the fullest extent by:

1. Answering the questionnaire as fully as possible.
2. Returning the questionnaire before the March 31 deadline.

Remember that the Institute is seeking to determine production figures only.

And please bear in mind that questionnaire forms will not be marked or identifiable; all replies will be destroyed after tabulation.

Let's all join in making this the most successful survey ever undertaken by the NLGI! ■

Available!

Manufacture and Application of LUBRICATING GREASES

by C. J. Boner

Chief Research Chemist
Battenfeld Grease and Oil Corp.

1954
982 pages
$18.50 prepaid

982
FACT-FILLED PAGES
IN THESE
23
BIG CHAPTERS

Here in one giant volume . . . the most complete storehouse of information ever published on the composition, properties and uses of lubricating greases!

The book begins by describing in detail the structure and theory of lubricating greases. Then follow chapters on the various raw materials, processes and manufacturing equipment. Lubricants containing specific thickeners, including such recent developments as lithium soaps, complex soaps and non-soap gelling agents, receive special attention.

Of major interest is the large section on present uses and future trends of lubricating grease products. Here you'll find the complete details of when, where, and how to apply a specific lubricant for any given purpose.

Everyone concerned with the preparation or use of grease lubricants will find Boner's book of enormous practical value. Manufacturers and lubricating engineers will find here a complete breakdown of the effects of each ingredient or treatment upon the characteristics of the final product, and a full explanation of the physical and chemical methods used in measuring these characteristics. Suppliers of fats, oils, additives, thickeners and other raw materials will gain new ideas for future product research and development. In addition, users of grease products will learn the properties of available lubricants and the major purposes that each fulfills.

MAIL THIS HANDY ORDER COUPON TODAY!

NLGI SPOKESMAN
4638 J. C. Nichols Parkway
Kansas City 12, Missouri

Please rush me a copy of Boner's MANUFACTURE AND APPLICATION OF LUBRICATING GREASES.

☐ I am enclosing $18.50
☐ Company Purchase Order

NAME_____

ADDRESS_____

_____

CITY & ZONE_____ STATE_____

Future Meetings

MARCH, 1958

4-6 SAE Passenger Car, Body and Materials Meeting, Sheraton-Cadillac, Detroit, Mich.

19-20 Ohio Petroleum Marketers Association, Annual Convention and Marketing Exposition. Deshler-Hilton Hotel, Columbus, Ohio.

31-Apr. 2 SAE National Production Meeting and Forum, The Drake, Chicago, Ill.

APRIL, 1958

9-11 API Division of Production, Mid-Continent District Meeting, Biltmore Hotel, Oklahoma City.

16-18 National Petroleum Association, Cleveland, Ohio

22-24 ASLE Annual Meeting and Exhibit, Hotel Cleveland, Cleveland, Ohio.

MAY, 1958

19-20 API Division of Marketing, Lubrication Committee Meeting, Point Clear, Ala.

21 NLGI Board of Directors meeting, Hibernia National Bank board room.

21-23 API Division of Marketing, Midyear Meeting, Roosevelt Hotel, New Orleans

22-23 API Division of Production, Pacific Coast District Meeting, Biltmore Hotel, Los Angeles.

JUNE, 1958

8-13 API Division of Production, Midyear Committee Conference, Hollywood Beach Hotel, Hollywood, Fla.

8-13 SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

22-28 ASTM 61st Annual Meeting, Hotel Statler, Boston, Mass.

SEPTEMBER, 1958

8 NLGI Board of Directors meeting, New York City, location to be announced.

10-12 National Petroleum Association, Atlantic City, N. J.

OCTOBER, 1958

14-16 ASLE-ASME Joint Lubrication Conference, Hotel Statler, Los Angeles, Calif.

20-22 SAE National Transportation Meeting, Lord Baltimore Hotel, Baltimore, Md.

22-24 SAE National Diesel Engine Meeting, Lord Baltimore Hotel, Baltimore, Md.

27-29 NLGI Annual Meeting, Edgewater Beach Hotel, Chicago, Ill.

NOVEMBER, 1958

5-6 SAE National Fuels and Lubricants Meeting, The Mayo, Tulsa, Okla.

FEBRUARY, 1959

2-6 ASTM National Meeting, William Penn Hotel, Pittsburgh, Pa.

***MARCH, 1959**

3-5 SAE Passenger Car, Body, and Materials Meeting, Sheraton-Cadillac, Detroit, Mich.

APRIL, 1959

21-23 ASLE Annual Meeting and Exhibit, Hotel Statler, Buffalo, New York.

JUNE, 1959

14-19 SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

21-26 ASTM National Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

OCTOBER, 1959

11-16 ASTM National Meeting, Sheraton-Palace Hotel, San Francisco, Calif.

19-21 ASLE-ASME Joint Lubrication Conference, Sheraton-McAlpin Hotel, New York, N. Y.

26-28 NLGI ANNUAL MEETING, New Orleans, La.

FEBRUARY, 1960

1-5 ASTM National Meeting, Hotel Sherman, Chicago, Ill.

APRIL, 1960

19-21 ASLE Annual Meeting and Exhibit, Netherland-Hilton Hotel, Cincinnati, Ohio.

JUNE, 1960

26 ASTM National Meeting with Exhibit, Chalfonte-Haddon Hall, Atlantic City, N. J.

OCTOBER, 1960

3-5 ASLE-ASME Joint Lubrication Conference, Hotel Morrison, Chicago, Ill.

*31-Nov. 1 NLGI Annual Meeting, Edgewater Beach Hotel, Chicago, Illinois.

APRIL, 1961

11-13 ASLE Annual Meeting and Exhibit, Bellevue Stratford Hotel, Philadelphia, Pa.

OCTOBER, 1961

30-31 NLGI Annual Meeting, Edgewater Beach Hotel, Chicago, Illinois.

*Tentative.

Continental puts extra service into every steel container

From advanced research to faster delivery, Continental container service smooths your shipping problems

Continental gives you the highest quality steel containers *plus* the benefits of famous Continental service. You deal with a Continental expert who knows the problems of the petroleum industry. You order from a complete line of steel containers, superbly lithographed for powerful sales appeal. You get fast delivery of all the containers you need, when you need them. And if you have a special problem, Continental's research and engineering services help you solve it. Let us show you what we mean by famous Continental service. Call today.

Exclusive Perma-Lining enamels provide 100% protection for hard-to-hold petroleum and chemical products. Perma-Lined containers are airless hot sprayed *after fabrication* to prevent corrosion-causing cracks and assure 100% complete interior coverage. In tight or open head pails—with lug, ring seal or lever lock covers.

CONTINENTAL CAN COMPANY

Eastern Division: 100 E. 42nd St., New York 17
Central Division: 135 So. La Salle St., Chicago 3
Pacific Division: Russ Building, San Francisco 4

nlgi spokesman

Volume XXI MARCH, 1958 Number 12

Published Monthly by the National Lubricating Grease Institute, T. W. H. MILLER, Editor; SUSANN SNYDER, Assistant Editor, 4638 J. C. Nichols Parkway, Kansas City 12, Missouri. Telephone: VAlentine 1-6771. 1 Year Subscription, $5.00. 1 Year Subscription (Foreign), $6.00

IN THIS ISSUE

THE COVER

NLGI symposiums are often the high point of an Annual Meeting, and the session on road building contractors entitled "Plans to Move the Earth" was no exception. This issue offers the third in a series of articles taken from the talk and our cover illustration shows the participants . . . R. L. Nelson, G. K. Brower, D. J. Rosselle, R. J. Brossmann and T. M. Murphy. Not shown is G. W. Krause, chairman. The Rosselle and Brossmann lubricant article begins on page 16.

EXPERIENCE of STEEL MILLS with the BLEEDING of LUBRICATING GREASES

By J. S. AARONS

National Tube Division
United States Steel Corp.

Presented at the NLGI 25th annual meeting in Chicago, October, 1957. Illustrations, courtesy the United States Steel corporation, National Tube division.

INCLUDED IN THE MANY properties inherent in a good lubricating grease is its resistance to oil separation by bleeding or pressure. It is not enough to define a lubrication grease simply as a reservoir for oil or a soap thickened oil since some of us, I'm sure, are familiar with the hard cake of a thickener, normally soap, which remains to clog up small bearing clearances through which fresh lubricant is fed. The problem of oil separation seems to divide itself into two phases; one of static proportions, namely bleeding, and the other dynamic or oil separation due to pressure.

Affecting both types of oil separation is a very important factor . . . temperature. This, of course, is in addition to base oil viscosity, amount of soap, configuration of the soap fibers, or processing of the grease.

In the absence of a recognized standard test for evaluating static bleeding, the procedure of the National Defense Research committee, Methods C-75T and C-77T which are included in the AN-G-3A specification, is used at the U. S. S. lubricants testing laboratory, National Tube division, United States Steel corporation. The test is conducted as follows: Approximately ten grams of the grease sample are weighed into a small 60 mesh screen cone which in turn is supported in a clean tared 100 ml. beaker and placed in a gravity convection oven maintained at 212F and held for 50 hours. After removal from the oven and cooling in a dessicator, the increase in weight of the beaker will indicate the amount of bleeding that has occurred. The loss in weight of the entire unit will give a measure of evaporation loss of the grease also. The effect of temperature on a group of lithium base E. P. greases using the above method at room temperature and 212F will be shown in a few moments.

The Pressure Oil Separation test for evaluation of the dynamic separation of oil from a grease has been adapted from a test used at the laboratories of the Standard Oil Development company. It consists of a Standard Oil development pressure viscometer cylinder with a piston and two threaded heads. The filter unit is made up of two steel rings with brass perforated plates soldered to them. The plate is a size 00 with 952 holes per square inch. Six allen set screws hold the filter plates firmly to one of the threaded heads. A sheet of No. 1 filter paper is used to separate each disc and to insure against any grease pushing past the bottom filter grid. The filter unit is then screwed into the cylinder and tightened. A 50 gram sample of grease is charged to the cylinder. The piston or follower plate is then adjusted. The cylinder is attached to a vertical post and connected to a nitrogen gas cylinder with flexible hosing and a pressure regulator. A weighed glass beaker is placed under the filter base to collect any separating oil. A pressure of 100 PSI is built up over a two to three minute period since a sudden surge may tear the paper. At the end of 22 hours, the amount of oil in the beaker is weighed. The result is expressed in grams rather than in percent since most of the separation takes place from the grease near the bottom of the filter unit and is independent of the grease charged.

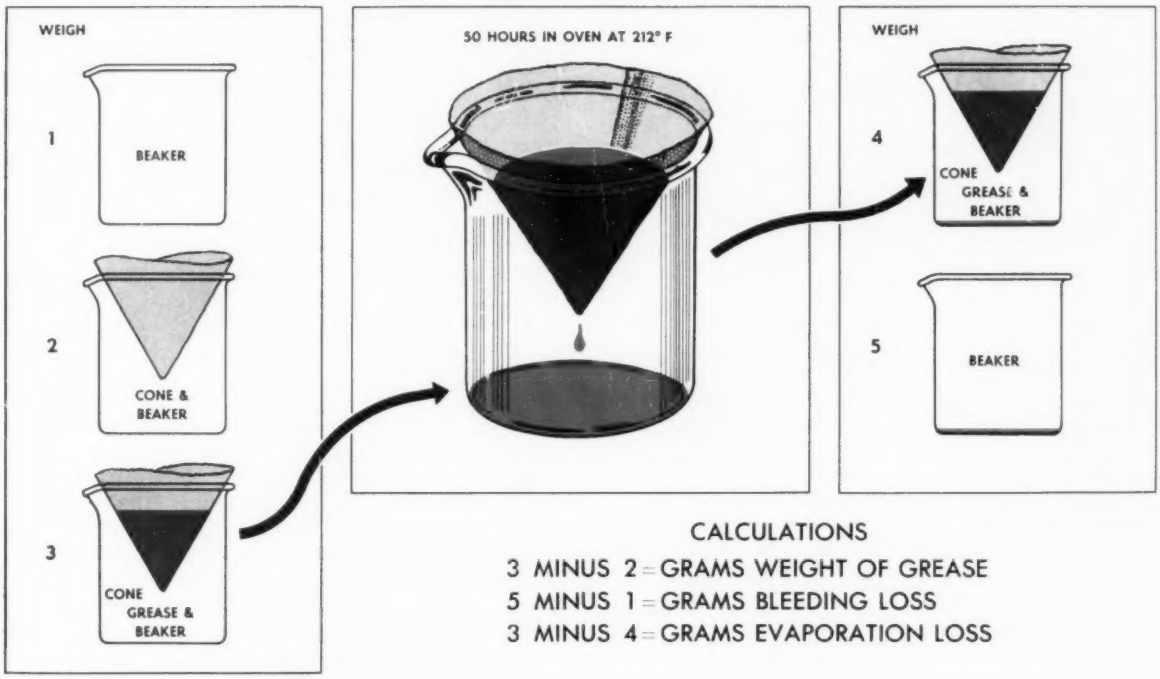
There is one point that should be brought out that is of interest. In disassembling the filter head of the test unit, a small amount of the sample, usually to a one-quarter inch thickness, is found which closely resembles the separated thickener of the grease. This material can be classed in various stages of hardness. The following table illustrates this condition.

Oil Separation Versus Penetration

Low Oil Separation		*Very Little Caking*	
1. Grams Oil	1.59	Penetration before	324 mm
		" (¼" portion) after	302 mm
High Oil Separation		*Extreme Caking*	
2. Grams Oil	26.6	Penetration before	290 mm
		" (¼" portion) after	46 mm
3. Grams Oil	15.6	Penetration before	295 mm
		" (¼" portion) after	80 mm
4. Grams Oil	18.4	Penetration before	250 mm
		" (¼" portion) after	76 mm

Bleeding and Evaporation

AN-G-3A SPECIFICATION METHODS C-75T AND C-77T
NATIONAL DEFENSE RESEARCH COMMITTEE



CALCULATIONS

3 MINUS 2 = GRAMS WEIGHT OF GREASE
5 MINUS 1 = GRAMS BLEEDING LOSS
3 MINUS 4 = GRAMS EVAPORATION LOSS

WHAT IS THE BLEEDING AND EVAPORATION TEST?

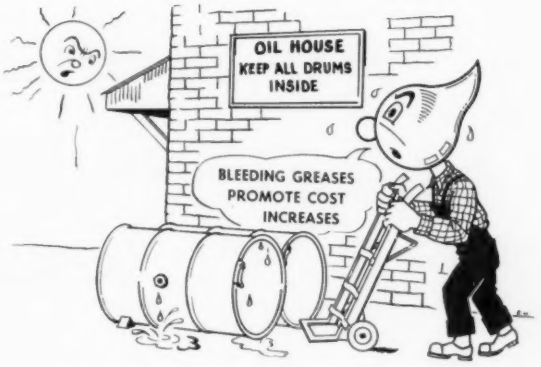
The Bleeding and Evaporation Test measures the oil separating and evaporation losses of a grease under fixed static conditions.

WHY THE TEST?

It measures bleeding tendencies of greases in storage.

PROCEDURE

A measured amount of grease is placed in a small 60 mesh screen cone which is supported in a clean tared beaker. The assembly is placed in an oven maintained at 212F for 50 hours. After removal from oven and cooling in a dessicator, loss in weight of the combined unit gives a measure of the evaporation of the grease and the increase in weight of the beaker gives the amount of bleeding that has occurred.



Medium Oil Separation		*No Caking*	
5. Grams Oil	8.1	Penetration before	290 mm
		" (¼" portion) after	254 mm

The above tests were determined at room temperature which averaged 80F. Doubtlessly, at a higher temperature more oil and caking could be expected. The laboratory at the present time is exploring this possibility using a temperature of 150F.

However, as mentioned before, the laboratory has done some testing on eight different lithium base extreme pressure greases using both the C-75T method of two temperatures and the Pressure Oil Separation test at the prescribed room temperature. The following table shows the effect of temperature on bleeding characteristics and also the correlation between the static and dynamic methods described. The visual inspection was reported on each sample approximately one month after receipt of the greases at the laboratory.

In the mills of the United States Steel corporation the preponderant amount of greases used are of a NLGI No. 1 consistency and it follows that there does not seem to be a great deal of trouble with oil separation whether it be with static bleeding, which would be associated with long term storage of grease products, or dynamic oil separation in centralized lubricating systems. Problems usually arise when ambient temperatures are high and, in most cases, the insulating of steam tracer lines which are found in close proximity to lubricating lines ends the trouble.

In all of the mills contacted "temperature" was the one word lubrication engineers mentioned when discussion on oil separation occurred. In the oil storage houses proper ventilation, insuring against elevated temperature conditions, was given as the best antidote for bleeding.

In the case of grease applications under extremely high temperature conditions, such as at soaking pit cranes, sintering plant, pallet wheels on the heating cars at the foundry, difficulty is encountered in finding materials capable of withstanding these temperatures. Our laboratory has developed a test called the Static Heat test which, in a measure, effectively evaluates material offered for this application. In this test a sample of grease is placed in a wire mesh basket and a micro penetration is taken. The sample is then placed on the lip of a beaker so that any separating oil will be caught in the beaker. The unit is then charged into an oven held at 350F. At 150 hours and 300 hours the sample is removed, cooled, and a penetration taken.

Typical results on greases using this test follow:

	Start	150 *Hrs.*	300 *Hrs.*
Grease A	60	44	38
Grease B	76	25	16
Grease C	80	17	1

In conclusion, the writer has attempted to show the effect of temperature on the bleeding characteristic of greases. As previously stated, other factors play a very important part, but from steel mill experience, temperature seems to be of prime importance. We shall continue to explore the possibilities of new test developments which will enable us to more accurately evaluate the static and dynamic oil separating and bleeding properties of greases. ■

Lithium Base E. P. Greases

NLGI	*Unworked Consis.*	*% Bleeding* @ 80F	@ 212F	*Pres. Oil Separation @ 80F Penetration Before*	*After*	*Gms. Oil*	*Visual Inspection Oil Separation 35 Lb. Pails*
0	380	11.14	37.60	380	220	19	Severe
0	350	3.52	24.40	350	154	8.52	Moderate to Severe
1	325	5.00	15.60	325	196	12.5	Slight
1	306	Nil	3.80	306	232	1.49	Traces
1	328	1.73	13.60	328	204	7.99	Moderate
1	319	1.66	11.9	319	136	7.55	Moderate
1	330	0.69	8.53	330	172	4.88	Moderate
0	348	2.88	21.5	348	200	6.34	Moderate to Severe

About the Author

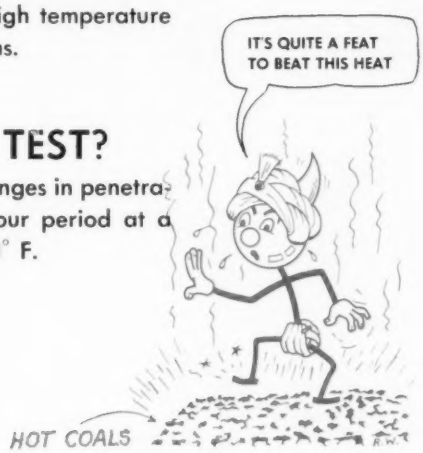
J. S. Aarons was graduated from the University of Connecticut in 1929. For the past 25 years he has been affiliated with the U. S. Steel corporation. For fifteen years of that time he was engaged in chemical analysis of coal by-products materials at the USS Clairton works. For the past eleven years he has worked in the lubricants testing Laboratory of the USS National Tube division. He has previously written about pumpability of steel mill greases in an earlier issue of the NLGI Spokesman.

STATIC HEAT TEST

UNITED STATES STEEL METHOD

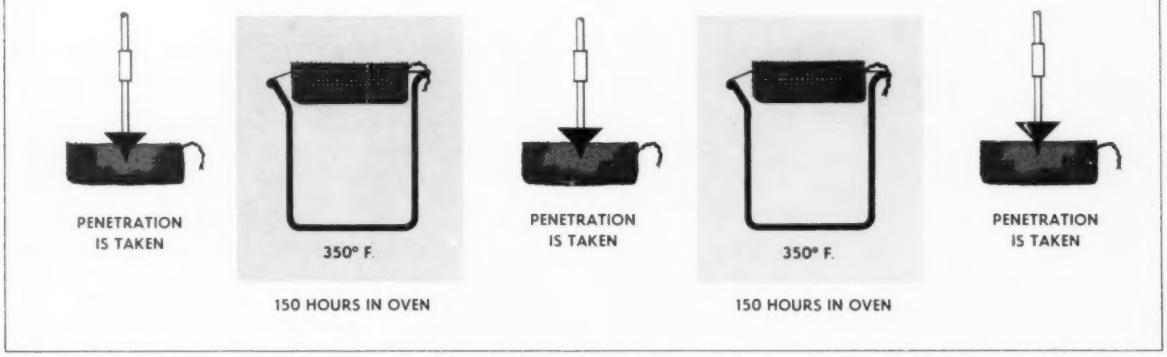
WHAT IS THE STATIC HEAT TEST?

The Static Heat Test measures the hardening characteristics of greases under prolonged high temperature and static conditions.



WHY THE TEST?

To measure the changes in penetration over a 300 hour period at a temperature of 350° F.



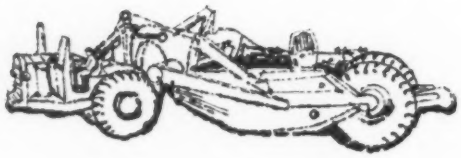
TEST PROCEDURE

A sample of the grease is placed in a small wire gauze container and a ¼ scale cone penetration is taken at 77°F ± 1°F. The container is then placed on a 100ml beaker and placed in an oven @ 350°F. Penetrations are made on the sample after 150 hours and repeated for the final reading at 300 hours. All penetrations are taken at 77°F ± 1°F.

TYPICAL RESULTS

	Start	150 Hrs.	300 Hrs.
Grease A.....	60	44	38
Grease B.....	76	25	16
Grease C.....	80	17	1

The Contractors' Partner—the



Lubricant Supplier

By D. Rosselle, R. J. Brossmann—Standard Oil Company (Ohio)

Abstract

The average highway contractor today has a multi-million dollar investment in large, highly complex, specialized equipment designed to do more work faster and with less man-power than it has ever been done before.

Lubrication of this equipment plays a vital part in the cost of operating and maintaining it. Today, many lubricant suppliers consider themselves to be the contractor's partner, and accept the responsibilities incumbent in such an arrangement.

A partnership, to be successful and endure must be profitable to both parties.

To this end, there are five keys to a successful contractor-lubricant supplier partnership—

1. The finest possible lubricant quality
2. Simplified lubrication through the use of multi-purpose products wherever possible
3. Product application information designed to get the proper lubricant in the proper place at the right time
4. Field engineering service designed to solve lubrication and other related problems
5. An adequate and prompt delivery service geared to get the lubricants on the job when and as they are needed.

With proper attention to all of these requirements, the lubricant supplier has found the keys to successfully fulfilling his obligations, and become the contractor's partner in every sense of the word, as he will have helped to reduce the cost of lubrication, minimized equipment downtime, and aided the contractor to meet his completion schedules.

Presented at the NLGI 25th annual meeting in Chicago, October, 1957.

This is the third in a series of articles presented at the NLGI 25th annual meeting panel on the lubrication of contractor's equipment, "Plans to Move the Earth." A fourth article will be offered later.

THE job of supplying lubricants to highway construction companies has become increasingly complex, due to the rapid mechanization that has taken place in highway construction. This enables us to do more work faster than it has ever been done before.

These advances are surprisingly recent. As late as the 1930's roads were still fashioned by hand labor, and doubtless most of you here today can remember the crews of men with picks, shovels and rakes, and the height of mechanization—a wheezing steam roller.[1]

Today it is possible for one contractor to move a million yards or more of dirt in a single month with the help of giant earth-moving machines, or pave as much as a mile a day of twelve foot wide highway using a tightly knit, co-ordinated group of highly specialized paving and finishing machinery fed by a steady procession of trucks. Hand labor is almost completely absent from these operations.

1. Albert C. Rose, "The Highway from the Railroad to the Automobile," in *Highways in our National Life, A symposium*, ed. Jean Labatut and Wheaton J. Lane (Princeton, 1950), p. 77.

The actual construction has been mechanized, and so too has the planning of a road, with the use of aerial photography and electronic computers. Long range planning is a new and potent force. Our roads began haphazardly, from the trails of animals, to the gradual widening of paths through long use. Through the years, if enough people travelled a path between two points, a road was built, later patched and still later, extended. The modern method of building a road where nobody has travelled and building such a road on a vast scale marks a new stage in highway development, one we are really just entering.

We'd like to speculate about the effects of such planning, but for our immediate purpose we'll note simply that planning makes large scale operations possible, operations which create a need for specialized machinery that is both costly and complex.[2]

Despite the high costs of construction equipment, labor and materials, we get more highway for our dollar today than ever before—highways of a type that were only dream roads a few years ago. Facts prove this. Increased costs notwithstanding, the average cost of the federal highway system to the user for construction, maintenance, and administration is less than one cent per vehicle mile—and this has been true ever since the 1930's![3] The record is astonishing, and the lubricant supplier has made a sizeable contribution in the form of better products at low prices. This has resulted in reduced equipment maintenance costs.

The higher speeds, heavier loads, and closer tolerances designed into the newer construction equipment have resulted in the need for higher quality lubricants. The varying lubricant recommendations for comparable equipment made by different manufacturers have created the need for multi-purpose products and simplified lubrication plans to both reduce the number of different lubricants that must be handled, and to minimize the chances of mis-application. New manufacturers are entering the heavy construction equipment field, and it is already apparent that some of these people are also overlooking the need for simplified lubrication in stating their requirements for certain very special products to us. This, of course, further complicates an already bad situation.

It is only fair to mention however that a sub-committee made up of representatives of many of the construction equipment manufacturing companies is working through the SAE to study "Ease of Maintenance." The subcommittee held its first meeting in April of 1956, and to date has concentrated mainly on simplified lubrication procedures. One of the objectives of this study is to establish SAE Recommended Practices to standardize and reduce the number of lubricants recommended by the different manufacturers.[4]

FIGURE 1, with $50,000 self propelled scrapers and push tractors needed to do many of today's construction jobs.

In addition to the problems mentioned, the contractor faces other difficult situations, unique to his type of operations. Such things as dirt, dust, mud, rain, extreme heat or extreme cold are ever present. Added to these are the problems of transient storage facilities, the fact that lubrication service must be taken to the equipment over all sorts of terrain, and the necessity of often employing inexperienced help

FIGURE 2 and a crane which could carry a $70,000 price.

2. See Adam C. A. Ehlshlager in *Construction Review* Vol. 2, No. 7, July, 1956, pp. 4-6; also *Engineering News-Record* Vol. 158, pp. 88 et seq, Jan. 24, 1957; same volume p. 100 February 7, 1957.

3. *Highways in the U.S.*, U.S. Department of Commerce, Bureau of Public Roads, 1954, p. 12. Also *Highway Facts*, Automotive Safety Foundation, 1952, p. 75.

4. R. W. Beal, *Ease of Maintenance—Simplified Lubrication* presented at the SAE National Farm, Construction and Industrial Machinery Meeting, Milwaukee, Wisconsin, September, 1957.

to perform the important job of equipment lubrication.

The cost of modern earth-moving equipment today staggers the imagination of those unfamiliar with the economics of this business. For example, an eighteen yard self propelled scraper, the main "production" unit on most earth-moving jobs, such as that shown in Figure 1 carries a price of approximately $50,000. Similarly, the large push tractors used to help these scrapers to load are priced almost as high. A power shovel or crane such as that shown in Figure 2 can cost $70,000 or more. Thus, even with a relatively small spread of equipment, the contractor's investment may well be several million dollars. Downtime for this equipment represents money that can never be recovered by the contractor. One contractor told us recently that a scraper represents a cost of $35-$75 per hour in lost production for unscheduled downtime. In fact, the scrapers pictured in Figure 3 were actually valued at $67.20/hour on this particular job by the contractor. If a breakdown were to occur to the "push tractor", the hourly cost could be many times as much, the total representing the combined cost of all the scrapers shut down due to loss of this

FIGURE 3. On this particular job, these big scrapers were valued at $67.20 per hour by the road building contractor.

one key piece of equipment. Similarly, the breakdown of any one piece of equipment in the paving spread shown in Figure 4 due to faulty lubrication would shut this entire operation down. From this, it is easy to see how an unscheduled shutdown could cost as much as $1,000 per hour. Proper lubrication is a must to protect an investment of this magnitude, and is the best insurance against unscheduled equipment downtime.

In the title of this paper, we refer to the fact that we consider the lubricant supplier to be a partner of the contractor. Any successful business partnership must be profitable if it is to survive, so it follows that the lubricant supplier must enable the contractor to reduce his lubrication and related costs and hold them to a minimum or he will no longer be a partner. Lubrication enters into a contractor's cost in three

FIGURE 4 shows the equipment used in paving one side of a four-lane divided highway. Faulty lubrication would cost.

ways: First, there is the obvious cost of the lubricants themselves and the handling, storing, and dispensing of them. These are tangible costs, and represent less than 1% of the total money spent for highway construction. The second cost affected by lubrication is equipment maintenance, which has been estimated to be a whopping 20% of the total highway dollar, or over 20 times as much as the cost of the lubricants themselves.[5]

The third cost factor influenced by lubrication of course is the staggering cost of unscheduled equipment downtime mentioned earlier. It is entirely possible that the loss of one piece of equipment for a period of two or three days due to the use of inferior "price" lubricant or over-extended lubrication or oil drain intervals could cost the contractor more than the entire cost of quality lubrication on a multi-million dollar job!

We shall devote the remainder of this paper to an explanation of how a successful lubricant supplier implements the contractor-lubricant supplier partnership. Although the details might vary from company to company, we like to think of a set of five keys to a successful relationship. These keys are:

1. Product Quality
2. Simplified Lubrication
3. Application Information
4. Field Engineering Service
5. Adequate, Prompt Delivery Service

Key No. 1 — Product Quality

The lubricant supplier must furnish the contractor only the very best lubricants for his equipment and at a reasonable price. All too often, however, price

5. See *Lubrication*, a technical publication devoted to the selection and use of lubricants, The Texas Company, Vol. 43 No. 7, page 92. July, 1957.

alone is used as the deciding factor when selecting a lubricant supplier, and the more important differences in lubricant quality are overlooked, or are not recognized by the contractor.

There has been a growing trend in recent years toward classification of many of the more commonly used lubricants according to military or other recognized specification levels. While this system does furnish a convenient system of reference between products of different manufacturers, one of the results has been a tendency toward using performance level as the criterion of quality rather than actual performance. Thus, while it is true that, in general, better results should be obtained from products of higher performance level, there can be differences just as great between different manufacturers' products of the same level.

This means that the contractor must look beyond the purchase price, and that the lubricant supplier must not only have product quality, but that he be able to sell it. You may remember that this subject was covered very adequately by Mr. C. E. Gore in his paper "Selling Customer Benefits" presented at last year's NLGI meeting.

Key No. 2 — Simplified Lubrication

Another method used by the lubricant supplier to reduce the contractors' costs is by the use of simplified lubrication recommendations.

We may have been somewhat amiss in omitting the equipment manufacturer as being in on the partnership described in the title of this paper, because he is also an important partner to the contractor, and to us, the lubricant supplier. We trust this omission did not imply that we were disregarding him. Naturally, we are leading up to a point here, and the point is this: everyone, and by this we mean the contractor, the equipment builder, the manufacturer of lubricant dispensing equipment, and the lubricant supplier, is in agreement that simplified lubrication is desirable. This means that the job should be done with the fewest number of lubricants possible. We are all fully aware of the fact that each individual contractor has a wide variety of comparable equipment made by different manufacturers. Without going into the reasons why this is so, we would like to point out that there exists in each manufacturer's line of equipment as well as between comparable equipment of different manufacturers, an extremely wide variety of lubricant recommendations that tend to "complicate the simplification." Let's take track roller lubrication as an example. Five makes of crawler tractors dominate the field, and each has a different lubricant specified for track roller lubrication. One manufacturer specifies mineral gear oil for his track rollers and idlers, another specifies a heavy duty motor oil, the third recommends only a special grease approved by him, the fourth also specifies a still different special grease that he must approve, and the fifth a "stringy, tacky lubricant of semi-fluid consistency."

To demonstrate the multiplicity of lubricants recommended by equipment manufacturers, we have summarized our understanding of the lubricants as recommended for summer use by the five leading scraper manufacturers and five tractor manufacturers for roughly comparable equipment in Figure 5. This list shows 20 different lubricants that would be necessary if the recommendations of the manufacturers were to be followed exactly—and this does not allow for alternate cold weather recommendations! Note that our simplified lube plan would reduce the total number of lubricants to 10, a 50% reduction, and four of these (circled) are used on only one manufacturer's line of equipment. In addition, we find SAE 50 motor oils recommended for transmission and final drive cases. If these five special purpose lubricants could be eliminated, a further 50% reduction in the total number to 5 lubricants could be realized. When the requirements of shovels and cranes, air compressors, motor graders, rock drills, paving equipment, and the multitude of other equipment that might be found on any given job are added to this, some realization of the magnitude of this problem can be gained.

We at Sohio have found that it is possible to care for almost 95% of the entire lubrication needs on most highway construction jobs with one motor oil in two viscosities, two greases, and a gear oil. This means only five drums to be handled and transported out on the job. We add other products to this basic package recommendation only when we feel it absolutely necessary. This would normally be due to the fact that a piece or pieces of equipment having an unusual requirement that cannot be satisfactorily handled by one of the multi-purpose lubricants was being used on the job.

While we realize that many of you are familiar with the product requirements of construction machinery, we feel that a review of these requirements and the important product properties is in order. With that thought in mind, we have summarized this information below.

Engine Oils

Diesel and gasoline engines found in construction equipment require a crankcase oil that performs the basic lubrication function, and in addition, maintains engine cleanliness (detergent-dispersant), resists oxidation, does not foam, has high film strength or load carrying ability, prevents bearing corrosion and af-

MANUFACTURER RECOMMENDATIONS 20 PRODUCTS	*Scraper A*	*Scraper B*	*Scraper C*	*Scraper D*	*Scraper E*	*Tractor F*	*Tractor G*	*Tractor H*	*Tractor I*	*Tractor J*	SIMPLIFIED RECOMMENDATIONS 10 PRODUCTS
ENGINE OIL											
Series 3–SAE 30	X					X					Series 3–SAE 30
Series 2–SAE 30							X				
Sup. 1–SAE 30			X								
MIL-L-2104A–SAE 10W	X		X	X		X	X	X	X	X	MIL-L-2104A 10W
Type C Trans. Fluid				X				X	X	X	
MIL-L-2104A–SAE 20		X									MIL-L-2104A–SAE 30
SAE 30	X			X	X	X	X	X	X	X	
SAE 50							X	X			MIL-L-2104A–SAE 50
GEAR OIL											
MIL-L-2105–SAE 90	X				X	X					MIL-L-2105–SAE 140
SAE 140	X	X		X		X	X		X	X	
SAE 250					☒						MIL-L-2105–SAE 250
St. Mineral–SAE 140		X	X	X	X				X		MIL-L-2105–SAE 140
GREASE											
Hvy. Duty Wheel Brg.–300°	X	X	X	X	X	X	X	X	X	X	
Chassis Grease		X		X	X		X		X		Heavy Duty, High Melting, Waterproof Multi-purpose Grease
Water Pump Grease			X		X						
Stringy-Tacky Semi-Fl.	X					X					
Magneto Grease							X				
Special Track Roller A								☒			Special Track Roller A
Special Track Roller B										☒	Special Track Roller B
OTHER											
Transformer Oil					☒						Transformer Oil
No. of Lubes Recommended by Manufacturer	7	5	5	7	8	7	8	6	7	6	

FIGURE 5. Authors summarize the lubricants necessary if recommendations of equipment manufacturers were followed.

fords reasonable protection against corrosion due to combustion acids. It must also have a sufficiently high viscosity index to assure easy engine starting on cold mornings, yet maintain an adequate viscosity at engine operating temperature. These requirements are all satisfied by an oil of the MIL-L-2104A level under normal operating conditions, and where fuel sulfur content is below 0.4%.

The exception to this is the extreme lubricant requirement of some new high speed super-charged engines. Series 3 motor oils are recommended for these engines, and can be used for all diesel engines, if the contractor so desires.

Hydraulic Oils

The primary function of hydraulic oil is to transmit power. In order to do so it must have proper viscosity, or flow properties, neither heavy enough to cause friction within the fluid itself, nor light enough to cause loss of efficiency in the system. This necessitates an oil having the proper viscosity for starting as well as at operating temperatures, making a high viscosity index oil mandatory.

In addition, the oil must resist foaming when sheared in the pump. Unless foaming is at a minimum, air will be compressed in the system causing erratic operation.

A hydraulic oil also lubricates the pump, bearings, cylinders, pistons, etc. It must contain rust and corrosion inhibitors to protect the working parts of the hydraulic system.

Finally, and perhaps most important, a hydraulic oil must have good chemical stability in order to insure satisfactory and uninterrupted operation of the

unit. If an oil is not stable, it will cause the build-up of gum or varnish, and increase in viscosity, both of which will cause erratic performance, and can result in acid corrosion of the working parts of the system.

Generally speaking, motor oils meeting the MIL-L-2104A level fulfill the above requirements.

Torque Converter Fluids

In general, two types of torque converters are found in construction equipment. The difference is in the fluids used. One type utilizes diesel fuel, and constantly circulates it from the fuel storage tank, through the torque converter, and returns it to the storage tank. The other type utilizes a light weight oil as the fluid, and since it is a closed system, the oil is being constantly re-used for a long period of time.

Theoretically, the ideal torque converter fluid would be less viscous than gasoline for easy fluid flow, and would have a specific gravity higher than asphalt for high kinetic energy transfer. Obviously such a fluid does not exist, and so compromises are made in the selection of one of the fluids mentioned above. Both have the advantage of satisfactory performance, ready availability, and reasonable price.

Torque converter fluids then should have as low a viscosity as possible for maximum efficiency. It goes without saying, however, that the viscosity must be sufficiently high to lubricate any bearings or other moving parts that may be located in the unit. The fluid should also exhibit a minimum of viscosity change with change in temperature—in other words, the highest practical viscosity index.

Particularly in closed systems, where the oil is re-used for a long period of time, the severe heat conditions tend to oxidize the fluid and form sludge and varnish deposits unless the oil is well fortified with an oxidation inhibitor. Resistance to foaming is necessary as foaming in the system can cause erratic operation. Likewise, the fluid must be capable of preventing rust formation. Even small amounts of rust in a converter can do a large amount of damage to precision made parts. Additionally, the fluid must not affect any seals used in the converter, and it must have a low pour point.

SAE 10W motor oils of the MIL-L-2104A type have all the desirable properties necessary to make them suitable for torque converter fluids. Many of these oils also have been qualified to meet the requirements for "Hydraulic Transmission Fluid, Type C" as required for use in one popular converter used on several different makes and models of earth-moving equipment.

Gear Oils

Straight mineral gear oils can be used successfully in transmissions, differentials, and other gear cases containing spur gears or spiral bevel gears where rolling contact only occurs between the teeth. When other gear types are used where there is sliding action as well as rolling action, such as that found in hypoid gear sets, an extreme pressure or multi-purpose type gear oil is required. Gear oils cushion the heavy loads usually existing in gear trains, including the shock loads often encountered. Without the extreme pressure properties imparted by multi-purpose gear oils, however, welding of the gear teeth can occur. These gear oils are also resistant to oxidation, and to corrosion.

Extreme pressures are not normally present in spur or spiral bevel gear trains. They can exist, however, if slight misalignment of the gears occurs. Because of the added protection afforded as well as from the standpoint of product simplification, it is desirable to recommend a multi-purpose gear oil of the MIL-L-2105 type for all gear case applications. These will probably soon be replaced by the improved type gear oils suitable for API Service GL-4 which are now being manufactured.

Grease

A good, high quality multi-purpose grease is a must for simplified lubrication plans. Such a grease should be water resistant for use in track rollers, water pumps, and as a chassis lubricant. It should have a melting point in the 350°-400°F range for use in the drum clutch bearings of shovels and cranes and tractor clutch throw-out bearings, etc., where a low temperature grease could run out and ruin clutch faces necessitating replacement. It must be oxidation stable and also have good mechanical stability. It must have load carrying ability high enough to make it suitable for heavy duty wheel bearings. It must have good dispensability even at low temperatures, resist impact and squeeze out, prevent rust, resist throw off, separation and bleeding.

The term "multi-purpose" is often misconstrued to mean "all-purpose" by field people. While there are many multipurpose greases that meet the requirements stated above, they are not "all-purpose" products, and there will be occasions when special greases will be required for a few specific applications. Some makes of track rollers fall into this category, as we have mentioned previously.

Open Gear Lubricants

Open gear lubricants must cling to the teeth of gears, even under conditions of high pressure, temperature, and speed. They must cushion heavy loads, minimize wear, be resistant to water, and be easy to apply. In the past, such lubricants were semi-solid in nature,

requiring heat for application, and were very difficult to apply. The result was that too often lubrication intervals were over extended. Today, however, special exposed gear lubricants, which can be handled like any other grease, are available to the contractor. These new lubricants contain additives to make them extremely adhesive, and are able to carry the loads required. Since they are easy to apply, proper lubrication intervals are more likely to be observed.

By study of his lubrication requirements, and consolidation through the use of multi-purpose products, a contractor can satisfactorily take care of approximately 95% of his lubrication requirements during warm weather with five basic products:

1. SAE 30 Engine Oil of the MIL-L-2104A level or higher for engines, air cleaners, and reciprocating type air compressors.
2. SAE 10W Engine Oil of the MIL-L-2104A level for hydraulic systems and torque converters.
3. Multi-Purpose MIL-L-2105 type gear lubricant for all gear cases.
4. Suitable multi-Purpose grease for all grease applications.
5. Exposed gear lubricant for swing gears, dipper sticks, and other open gears.

We have already mentioned the SAE sub-committee which is studying ease of maintenance. Their report to a recent National SAE Meeting in Milwaukee presents the results of a national survey of maintenance and lubrication habits of construction equipment users and indicates that almost 60% of the people contacted service their equipment from a lube truck such as that shown in Figure 6. This is practical, because simplified lubrication practices reduce the number of different lubricants to a quantity that can be conveniently carried on a truck. In addition, pneumatic dispensing equipment can be used, since lube trucks are normally equipped with air compressors.

By combining all of the various lubricant requirements into a minimum number of products, the volume of each becomes large enough to justify purchase of all of them in full drums, for economy. At the same time, the lubricants are kept clean and uncontaminated because of the manner of dispensing, the chances of mis-application are minimized, and the time required for lubrication is reduced.

Key No. 3 — Application Information

The finest of lubricants and simplified lubrication plans are worthless unless the application of the lubricants is correct. Although the quality of many of the

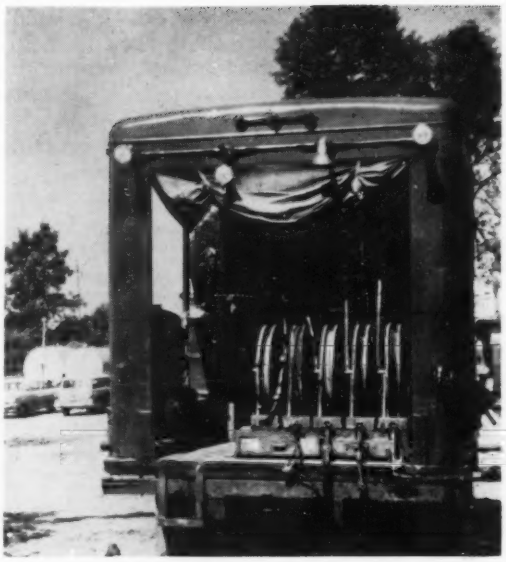


FIGURE 6 and the contractor's field lube truck, equipped with rotary air compressor, light plant and flood lights, pneumatic dispensers, space for drums, and five hose reels.

new multi-purpose lubricants is such that some misapplications can be tolerated for short periods of time, such practices will ultimately lead to trouble. Modern equipment is so diversified and complex that a handy, condensed lubrication guide is a must to "get the right product in the right place at the right time."

This lubrication guide is prepared for the contractor by the lubricant supplier for the use of the lube man, and interprets the simplified lube plan so clearly and concisely that it is virtually impossible to make a mistake, if it is used. It is also important that this guide be in a form that is handy for the lube man to refer to on the job.

Other application information is also furnished such as general product data, and bulletins which keep the contractor posted on the latest information pertaining to lubrication.

If we might make a personal aside here, it has been the experience of the authors that the lube man on most contractors' spreads is the "low man on the totem pole." Too often the man with the least experience and fewest qualifications is assigned to the job. It is our hope that the importance of proper lubrication will be more widely recognized by our partners, and that the status of the lube man will be raised by placing him on a level comparable to equipment operators or others in the organization. Such a move would take him out of the "unskilled labor" category, and attract and keep good men on the job.

Key No. 4 — Field Engineering Service

A vital part of the contractor-lubricant supplier partnership is the lubricant supplier's well-trained, competent field engineer. This man is not only the contractor's partner, but because of his knowledge and the nature of his day to day activities, becomes the equipment builders' partner as well. He not only assists the contractor, but helps the equipment builders' service people whenever possible, works with them in the solution of problems, and keeps them informed of problems he is encountering.

One of the most frequent reasons that the field engineer is called in is for parts failure diagnosis. This is an art that all too few people pursue or are qualified to do. It is a combination of training, experience, mechanical ability, and product knowledge that enable the field engineer to recognize the true reason for a failure. Only by knowing the true reason can the proper remedial steps be taken to insure that a similar failure will not occur again.

Failure analysis is an activity whose importance cannot be overlooked. It is by its very nature a post mortem, however, that takes place after the damage has been done, and can at best prevent a reoccurrence. More important than failure analysis is the preventive work that is done by the field engineers. Typical of some of the problems encountered and solved by our men was one that arose a few years ago. A major equipment manufacturer introduced a piece of equipment that was new from the ground up. Shortly after a customer of ours purchased several of these machines, our engineer received a complaint that "the motor oil was causing a sticky, dark deposit to form in the engine oil filters." Quick action on this man's part determined the real culprit to be permanent antifreeze, which had leaked past the head gaskets and thence into the crankcases. Immediate steps were taken to: (1) Flush the crankcases of the engines with suitable chemicals so as to remove the deposits and to prevent seizure of the engines, (2) Determine the source of the trouble, and (3) Inform the equipment manufacturer and his field service people of the problem and how to flush the engines.

On another contractor's job, a field engineer found the following: engine oil filter elements were installed improperly and in such a manner as to restrict oil flow; engine oils were being transferred from drums to equipment in a pail that had been setting atop the drum and had accumulated large quantities of dust and dirt; and grease was being applied without first wiping the dust and dirt from the fittings. In this case, the engineer sold the contractor on the value of better trained and more competent lube personnel, and also assisted him to set up modern, mobile dispensing equipment. These steps reduced engine bearing failures from seven in one month to zero in the next year, and reduced wear of other engine parts and at grease lubricated points by an equal ratio.

The field engineer is also qualified to make product recommendations, to make equipment surveys for the purpose of lubricant simplification, and has an intimate knowledge of product which enables him not only to make the recommendations, but also to explain them. This is often necessary because people who have been working with equipment for many years, and who have the responsibility for its maintenance, understandably have their own ideas on equipment lubrication, and often are not in agreement with the recommendations. It is important that these differences be resolved.

Another often overlooked function of the field engineer is to be the eyes and ears of the lubricant research and development groups of his company. He has a responsibility to recognize and report areas where changes or improvements can be made in lubricants. It is in this manner that the lubricant supplier constantly improves his product to keep pace with the ever changing and more severe lubrication requirements of new equipment.

Key No. 5 — Adequate, Prompt Delivery Service

The matter of delivery of lubricants to the contractor's job should not be overlooked. In order to satisfactorily care for the contractor's needs, the lubricant supplier must maintain adequately stocked warehouse facilities located such that deliveries can be made when supplies are needed, and in the quantities desired. Frequent deliveries and ready availablility reduce the inventory that the contractor must carry on the job. Many contractors have made the observation to us that with some suppliers they were forced to take large deliveries to obtain a price, wait for lubricants because they were not available on short notice, and even purchased emergency supplies from unknown suppliers.

The lubricant supplier should realize that large inventories of lubricants on a job create storage and handling problems. They are also subject to contamination by water and dirt; and damage from heat and cold on occasion. There is another occurrence that arises in connection with drums that have been stored in the open for extended periods of time. Product identification markings that have been stenciled on the drums become illegible or disappear completely. This can create a very serious problem if someone makes a wrong guess as to what the drum contains as the result of a "sniff and feel" analysis.

One way we have found to eliminate these problems is to set up a maximum and minimum inventory of each product with the contractor. Drums can then be stored in a designated storage area in an orderly ar-

rangement so that a quick check can be made, and inventories automatically replenished as necessary. This can be done on a weekly or semi-weekly basis.

Conclusion

To summarize what we have said, the modern highway contractor has a highly complex, thoroughly mechanized and expensive operation. The success or failure of this operation is dependent on many factors, not the least of which is the lubrication of the equipment. Many lubricant suppliers today, however, consider themselves to be the contractor's partner, and accept the responsibilities incumbent to such an arrangement. The five keys to a successful contractor-lubricant supplier partnership are:

1. Providing the best possible lubricant quality
2. Selection of multi-purpose lubricants for simplified lubrication
3. Proper application of the lubricants
4. Field engineering support
5. Adequate, prompt delivery of lubricants to the job.

With proper attention to all of these requirements, the lubricant supplier has found the keys to successfully fulfilling his obligations and has become the contractor's partner in every sense of the word as he will have helped to reduce the cost of lubrication, minimized equipment downtime and aided the contractor to meet his schedules.

Bibliography

In addition to the references cited in the footnotes, see *The Statistical Abstract of the United States.* Invariably helpful are the publications of the American Road Builder's Association, particularly Report of Task Force 3. See the bibliography in George Stewart's *U. S. 40,* (Boston 1953). Interesting pictures of early roads and automobiles as well as historical information about the growth of travel can be found in Earl Pomeroy's *In Search of the Golden West* (New York 1957). The best general survey for highways and highway construction is the Labatut and Lane symposium, cf. fn.1, *supra.*

Similar conclusions have been reached independently by Donald S. Robertson in "How to Sell Petroleum Products to the Construction Industry" *Proceedings American Petroleum Institute* Vol. 36, II 1956 p. 188, and by H. A. Radzikowski in "What Earthmoving Machinery Has Done To Control Costs," a paper for the SAE National Farm Construction and Industrial Machinery Meeting, Milwaukee, Wisconsin, 1957.

"Big Jobs Demand Big Tools," *Construction Methods* 37:52-7 November 1955

"Economic Aspects of the New Highway Program" *Construction Review* 3:3, March 1957

"Ideas Fly Thick and Fast on Equipment Utilization" *Roads and Streets* 99:79 March 1956

"Lives of Highway Surfaces, A Half Century Trend" *Public Roads* 29:17 June 1956

"Simplify Your Lubrication Needs," *Steel* 138:94 March 19, 1956

The History and Accomplishments of 25 Years of Federal Aid For Highways

American Association of State Highway Officials, Cincinnati, O. 1941

S. J. Rosselle *received his B. S. degree in mechanical enginering from Michigan College of Mining and Technology. After graduation, he joined Sohio Pipeline company where he served as a division engineer and project engineer. He then joined Sohio's field engineering group where he was a fuels and lubricants consultant to contractors and other users of heavy duty automotive equipment. In his present capacity, he is product application engineer in the Sohio sales technical division. In addition to other duties, he is actively engaged in the technical writing and training fields.*

About the Authors

R. J. Brossmann *is presently engaged as a product development engineer and also acts in an advisory capacity in product application in the Sohio sales technical division. He received his B. S. in chemistry at Wagner college and pursued his engineering education at Pratt Institute and Columbia University. Brossmann was formerly associated with Socony Mobil company, and has had twenty three years of experience in grease production, machinery design and product application of all types of lubricants.*

THE INDEX TO THIS VOLUME HAS BEEN REMOVED FROM THIS POSITION AND PLACED AT THE BEGINNING OF THE FILM FOR THE CONVENIENCE OF THE READER.

rangement so that a quick check can be made, and inventories automatically replenished as necessary. This can be done on a weekly or semi-weekly basis.

Conclusion

To summarize what we have said, the modern highway contractor has a highly complex, thoroughly mechanized and expensive operation. The success or failure of this operation is dependent on many factors, not the least of which is the lubrication of the equipment. Many lubricant suppliers today, however, consider themselves to be the contractor's partner, and accept the responsibilities incumbent to such an arrangement. The five keys to a successful contractor-lubricant supplier partnership are:

1. Providing the best possible lubricant quality
2. Selection of multi-purpose lubricants for simplified lubrication
3. Proper application of the lubricants
4. Field engineering support
5. Adequate, prompt delivery of lubricants to the job.

With proper attention to all of these requirements, the lubricant supplier has found the keys to successfully fulfilling his obligations and has become the contractor's partner in every sense of the word as he will have helped to reduce the cost of lubrication, minimized equipment downtime and aided the contractor to meet his schedules.

Bibliography

In addition to the references cited in the footnotes, see *The Statistical Abstract of the United States*. Invariably helpful are the publications of the American Road Builder's Association, particularly Report of Task Force 3. See the bibliography in George Stewart's *U. S. 40*, (Boston 1953). Interesting pictures of early roads and automobiles as well as historical information about the growth of travel can be found in Earl Pomeroy's *In Search of the Golden West* (New York 1957). The best general survey for highways and highway construction is the Labatut and Lane symposium, cf. fn.1, *supra*.

Similar conclusions have been reached independently by Donald S. Robertson in "How to Sell Petroleum Products to the Construction Industry" *Proceedings American Petroleum Institute* Vol. 36, II 1956 p. 188, and by H. A. Radzikowski in "What Earthmoving Machinery Has Done To Control Costs," a paper for the SAE National Farm Construction and Industrial Machinery Meeting, Milwaukee, Wisconsin, 1957.

"Big Jobs Demand Big Tools," *Construction Methods* 37:52-7 November 1955

"Economic Aspects of the New Highway Program" *Construction Review* 3:3, March 1957

"Ideas Fly Thick and Fast on Equipment Utilization" *Roads and Streets* 99:79 March 1956

"Lives of Highway Surfaces, A Half Century Trend" *Public Roads* 29:17 June 1956

"Simplify Your Lubrication Needs," *Steel* 138:94 March 19, 1956

The History and Accomplishments of 25 Years of Federal Aid For Highways

American Association of State Highway Officials, Cincinnati, O. 1941

About the Authors

S. J. Rosselle *received his B. S. degree in mechanical enginering from Michigan College of Mining and Technology. After graduation, he joined Sohio Pipeline company where he served as a division engineer and project engineer. He then joined Sohio's field engineering group where he was a fuels and lubricants consultant to contractors and other users of heavy duty automotive equipment. In his present capacity, he is product application engineer in the Sohio sales technical division. In addition to other duties, he is actively engaged in the technical writing and training fields.*

R. J. Brossmann *is presently engaged as a product development engineer and also acts in an advisory capacity in product application in the Sohio sales technical division. He received his B. S. in chemistry at Wagner college and pursued his engineering education at Pratt Institute and Columbia University. Brossmann was formerly associated with Socony Mobil company, and has had twenty three years of experience in grease production, machinery design and product application of all types of lubricants.*

Patents and Developments

Stabilized Greases

U. S. Patent 2,813,828 issued to H. A. Woods and L. C. Bollinger, assigned to Shell Development Company. Oxidation resistance and extreme pressure properties are imparted to lithium stearate greases by incorporation therein of 0.25 to 2% each of sodium petroleum sulfonates, octylphenoxytetraethoxyethanol, dilauryl selenide and phenothiazine. The oil comprises a major amount of bis (2-ethylhexyl) sebacate and a minor amount of mineral oil. Broadly, the patent claims an alkali metal soap grease containing 0.1 to 3% by weight each of a th[illegible]oli rylamine and a compound of the general formula

$$R(X)_n\text{-}R_1$$

Wherein R is an aliphatic radical, R_1 is a substituent including hydrogen or aliphatic radicals, X is selenium or tellurium, and $_n$ is a full integer less than 3, the compound having at least 8 carbon atoms per molecule.

Alkali Fusion Soaps of Polysaccharides as Thickeners for Greases

U. S. Patent 2,801,976 issued to A. J. Morway and J. H. Bartlett, assigned to Esso Research and Engineering Company. Polysaccharides or their esters, such as cellulose triacetate, are fused with caustic at 530°-570°F., to produce salts which, particularly in combination with fatty acid soaps, serve as thickeners for grease formulations. A suitable polysaccharide is Polycel (RCB-A-200), made by West Virginia Pulp and Paper Company, containing over 80% pure alpha cellulose. Other polysaccharides include starch and similar materials free of lignin and having at least 24 carbon atoms per molecule. The polysaccharide salt should comprise 30-50% of the grease thickener, the remained preferably being a soap-salt complex.

Low Temperature Grease of Improved Yield and Load Bearing Properties

Patent 2,813,829 issued to H. A. Woods and L. C. Bollinger, assigned to Shell Development Company. Improved grease compositions are produced by utilizing a mineral oil having a viscosity index of at least 70, and viscosity between 70 and 150 SSU at 210°F., the oil being gelled with a lithium soap of a hydroxy fatty acid. It should also contain 0.25 to 2.5% by weight of an alkaline metal naphthenate, e.g., 0.5 to 1.5% of calcium petroleum naphthenate such as "Advance Solvents Co.'s Grade A." The lubricating oil preferably is a blend of refined mineral oil lubricant from a distillate fraction combined with at least an equal proportion of a mineral oil bright stock. Oxidation resistance may be improved by addition of phenyl-alpha-naphthylamine or 1-salicylol amino guanidine monooleate.

The following is taken from a Shell Development company public relations release and is presented as a service to NLGI SPOKESMAN *readers in its entirety:*

Shell Scientists Run Steel Bearings at 1000 Degrees—Without Oil

A research group working under a U. S. Air Force contract has developed a way to overcome a major obstacle in the development of ultrasonic aircraft and guided mis-

Steel Bearings Run Without Oil *Continued*

siles, it was discosed January 15, in Detroit.

Dr. Alfred G. Cattaneo of the Shell Development company, a member of the group, said the research team had found a means of operating metal bearings at temperatures approaching 1,000 degrees Fahrenheit without the aid of conventional lubrication. Oils and greases now in use limit operating temperatures of metal bearings to about 500 degrees Fahrenheit.

Dr. Cattaneo pointed out that lubrication has become increasing difficult as aircraft have reached and exceeded the speed of sound. At such speeds, he said, the air passing over the aircraft reaches such high temperatures that it can no longer be used to cool the lubricating system. The new method promises successful operation of aircraft and guided missles through temperature ranges which until now have made lubrication either extremely difficult or impossible, Dr. Cattaneo said.

The research project was described in a paper on "Protective Atmosphere for High-Temperature Bearing Operations" by C. H. Bailey, Stanley S. Sorem and A. G. Cattaneo which Dr. Cattaneo read before the annual meeting of the Society of Automotive Engineers at the Hotel Statler. The paper was based on work done at the Shell Development research laboratories at Emeryville, Calif., by the authors.

Shell officials said the investigation followed up a discovery made by Mr. Sorem in the course of the company's program of basic research. When the results hinted at practical usefulness to the country's missile program, Shell informed the Air Force which then sponsored an additional research program to explore application of the discovery. The report read today described this Air Force-sponsored study.

Dr. Cattaneo said the group based its investigation on the theory that there is no metallurgical reason why roller bearings made of tool steel cannot operate satisfactory up to at least 1,000 degrees Fahrenheit. He also recalled that there are many examples of steel rolling successfully on steel without oil—notably the rolling of a railroad wheel on its rail.

Theoretically, there is no sliding friction between a rolling element and its race if point contact is assumed. In practice, however, a bearing and its race deform under load and therefore touch over a small area rather than a single point.

Early in the investigation, the group found that the deformation of the rolling element and its race is elastic. It was therefore conclud-

ed that no slipping occurs between the bearing and the race, and that consequently no lubricant is needed to lessen sliding friction.

Sliding does occur between the bearing cage and its rolling elements. Pressure on these sliding surfaces is very small, however, if a precision-made and properly-aligned bearing is used. The group, therefore, decided to investigate why bearings broke down when they operated without oil or grease lubrication.

Tests were carried out on the cantilever end of a 10,000 r.p.m. spindle, with the bearing held in a housing which could be electrically heated to 1,000 degrees Fahrenheit. These tests at first produced very erratic results, even with very slight bearing loads, with bearings lasting from a few seconds to several hours.

More consistent test results were achieved only after increased attention was given to a number of mechanical details. These included a far more critical bearing fit, alignment and cage balance than would have been necessary with conventional lubrication. It was also found necessary to "break in" bearings by operating them with oil lubrication before test runs.

Under these conditions, a definite performance pattern emerged. The investigators then learned that the bearing breakdowns were caused by iron oxide which formed during the dry operation and acted as an abrasive. Once formed, the oxide caused rapid wear of all bearing parts, resulting eventually in failure of the bearing.

The research group then decided to add to the air surrounding the bearing a substance which would attract the oxygen in the air, thus preventing it from attacking the bearing surfaces. A small amount of hydrocarbon vapor was found to have this effect, and it then became possible to operate bearings for many hours without failure of the ball and race surfaces, Dr. Cattaneo reported.

Failure did occur, however, as

1958 NLGI FELLOWSHIP AWARD MADE

Working for the Lubricating Grease Industry Since 1951, an Institute-Sponsored Research Program Is Continued on Rheology

Eyring

Hahn

The National Lubricating Grease Institute has for several years maintained a research fellowship at a recognized university, on pure or fundamental work. Such a program was designed in 1951 to build a pool of scientific knowledge, as insurance of manufacturing progress for the industry. Currently, the Institute is maintaining a program at the University of Utah in Salt Lake, considered to be one of the foremost centers of the world in the study of flow mechanics and other reaction processes.

In making the grant again to the University last month, NLGI president R. Cubicciotti noted to Utah's president Dr. A. Roy Olpin that the $2,500 was to enable a full-time graduate student to study in the broad field of the rheology of lubricating greases. The fellow will again be Mr. Sang Joon Hahn, who held the fellowship for 1956-57. Hahn will work under the general direction of Dr. Henry Eyring, an authority on rheology.

Hahn, who co-authored an article with Eyring and T. Ree in the June, 1957 NLGI SPOKESMAN, will also present a paper in a future issue of the journal entitled "Flow Properties of Lubricating Oils Under Pressure." The 36 year old Hahn, a native of Seoul in the Republic of South Korea, is devoting his graduate research to studies on the mechanisms of liquid flow.

Bearings Run Without Oil *Continued from page 31*

the result of scuffing, or metal pick-up, on the rubbing surfaces of the cage. In conventional lubrication, scuffing is prevented by use of "extreme pressure" additives which alloy with metal to provide a lubrication surface.

The investigators found that if such additives were used during the "break-in" period and were then added in vapor form with the hydrocarbon vapor, a lubricating film developed on the rubbing surfaces of the cage and the rolling elements.

The members of the research team called this process "protective atmosphere" lubrication. Dr. Cattaneo reported the method has been used successfully to operate bearings for 100 hours in temperatures approaching 1,000 degrees Fahrenheit without any evidence of pending failure in the rolling element, races and cages.

Regarding aircraft use, Dr. Cattaneo said it was "particularly fortunate" that JP-4, a widely-used jet fuel, has been found expecially useful in providing the "protective atmosphere" used in the bearing tests. He said the fuel was found to contain resins which combine with extreme pressure additives to form improved lubrication films on the bearing surfaces.

Dr. Cattaneo told the SAE delegates that further work on "protective atmosphere" lubrication is now being conducted at the Emeryville research laboratories of the Shell Development company. He said the current investigations are aimed at defining optimum combinations of materials and mechanical configurations for use with the new method.

People in the Industry

API Lubrication Committee for 1958

Membership of committees functioning in 1958 under the sponsorship of the Division of Marketing of the American Petroleum Institute was announced this month . . . of special interest to NGLI Spokesman readers are the appointments of the Lubrication Committee chairman, vice chairman and secretary.

Serving as chairman is G. Harold Osborne of the Kendall Refining company, at Bradford, Pa. Vice chairman is J. H. Yater, the Esso Standard Oil company, in New York. Secretary is G. A. Olsen, Sunland Refining corporation, Fresno, California. Olsen is also a member of the NLGI Board of Directors and was the 21st president of the National Lubricating Grease Institute in 1954.

The purpose of the API Lubrication Committee is to give qualified assistance on the lubrication problems of automotive, aviation, marine, and industrial manufacturers and users.

Spanish Expert Visits The United States

While making a tour of the United States, inspecting industry and labor practices in the interests of the Spanish government, Colonel Pedro Salvador Elizondo, chief of the research and development division at the Directorate-General of Industry and of the Spanish Army, visited American Lubricants, Inc., in Buffalo, New York. There, he made a study of grease, protective coatings for machinery, armament and modern packaging. The colonel is interested in modernizing methods in Spain and in taking comprehensive reports and recommendations back with him.

A research technologist in lubricants and protective coatings, Colonel Salvador is in this country under the auspices of the International Cooperation Administration, Washington, D. C. He reports that Spain has made excellent progress industrially during the past twenty years and that they now produce many of the basic products formerly imported. He feels that the standard of living in Spain is improving with more money for the workers and they are on the

GREETING Col. Elizondo (right) is (center) H. R. Katzmann, president of American Lubricants and Melville Ehrlich, vice president and director.

brink of new economic prosperity.

In conferring with H. R. Katzmann, president of American Lubricants, and with Melville Ehrlich, vice president in charge of research and development, the colonel was particularly interested in the automotive and industrial products because of the increasing motor vehicle and industrial machinery use in his country. Colonel Salvador is president of the lubrication and brakefluids study committee in Spain, president of the arms and equipment preservation study committee, and holds other high positions in the Spanish government. Following his visit to Buffalo, Colonel Salvador plans to spend about three months visiting other industries in this country and inspecting the oil-producing areas of the west.

National Cylinder Forms a New Construction Division

Major changes in the organizational structure of National Cylinder Gas company include the formation of a separate division to design and construct processing plants for the chemical, petroleum and other industries, it was announced.

Charles J. Haines, National Cylinder Gas company president, said W. Roberts Wood has been appointed president of the Girdler construction division.

Three other new divisions were established: the NCG division—J. L. Adank, president and Fred C. Heppel, executive vice president; the Girdler Process Equipment division—John E. Slaughter, Jr., president, and Lyman L. Dawson, vice president; and the Chemical Products division—Walter H. Girdler, Jr., president.

National Cylinder Gas Company now has a total of seven divisions, of which the other three are Tube Turns—John G. Seiler, president; Pennsylvania Forge company—James S. Kerwin, president; and Perforating Guns Atlas corporation—Paul J. Charrin, president.

President Haines also announced formation of a new foreign subsidiary to be known as NCG International, with Fred C. Heppel as president. It will operate the company's gas-producing business in Canada, Venezuela, Colombia and other countries.

"The new structure," Mr. Haines said, "recognizes the greatly increased volume and importance of a number of product lines and services and lays the foundation for further expansion of the company."

W. Roberts Wood joined the Girdler corporation in Louisville in 1929 as a research engineer. In 1941 he was elected vice president. In 1953 that company merged with National Cylinder Gas company and he became head of the Girdler company division.

Girdler Process Equipment division, manufacturers of heat exchange equipment used in the continuous processing of lubricating greases, chemicals and other products and high-frequency electric heating equipment used in the electronic bonding and curing of plywood, plastics, synthetic rubber and other products.

New Appointments Made By Pfaudler Division

The Pfaudler division of Pfaudler Permutit Inc. has appointed several men to new positions in a revision of sales coordination along company lines.

Division sales manager A. L. Gray announced the changes, saying "the sales administrative staff is being grouped by Pfaudler products to give greater flexibility and better customer service than our former organization by types of customers' industries."

Robert E. Smith, former assistant manager of chemical sales, has been named vessel sales manager.

H. E. P. Barta has been appointed machinery sales manager. He was formerly in charge of project engineering sales.

Elmer Wight has been promoted to customer service manager after extensive experience as a company sales correspondent.

Donald C. Doyle becomes Pfaudler division advertising manager.

Announce Chief Executive for Penola

Election of Stanley P. Gildersleeve to succeed Clarence M. Davison as president of the Penola Oil company, a marketing affiliate of Esso Standard Oil company, was announced by Esso President Stanley C. Hope.

Mr. Davison, who has been president of Penola since 1941, retired January 31 after more than 46 years with Esso and its affiliates and their parent Standard Oil company (N.J.). He started as a $5.50-a-week office boy with Jersey Standard in December, 1911.

Mr. Gildersleeve has served as Penola's vice president and general manager since 1952. Penola markets lubricating oils, waxes and greases and other petroleum specialty products, both in this country and overseas.

Mr. Gildersleeve's company career started as a lab assistant with Jersey Standard's scientific affiliate —now the Esso Research and Engineering company—more than 32 years ago, shortly after he was graduated from Yale.

He later served as assistant marketing manager for Esso Standard in Pennsylvania, in charge of lube-oil and industrial sales; he headed the marketing of Paraflow, the company's first lubricating-oil additive, when it was introduced; and was in charge of international marine lubricating-oil sales for Esso when he left for three and one-half years' Navy service during World War II.

Returning to Esso in 1945, he again served as head of marine lube-oil sales until 1950, when he was elected a director of Penola. He was named a vice president the following year.

Mr. Davison's first job with the Jersey Standard organization, at eighteen, was in the office of the late F. H. Bedford, then vice president in charge of foreign and domestic lube-oil sales.

His marketing career began in 1925, and in 1934 he was named by Esso Standard to head its wholesale sales of lube oils. Seven years later, when added responsibilities in the marketing of lubricating oils and greases had been assigned to Penola, Mr. Davison was named its president.

USI Names Rader as Asst. Production Manager

William H. Rader has been made U. S. Industrial Chemical compa-

ny's assistant production manager for Petrothene Polyethylene resins. U.S.I. is a division of National Distillers and Chemical corporation. The appointment was announced by Robert H. Cornwell, vice president in charge of production.

Mr. Rader was employed by a consulting firm from 1941 to 1943 as a naval architect. In 1943 he enlisted in the U. S. Navy and was assigned to ship repair, salvage and underwater work. Upon completing his military service in 1946, Mr. Rader resumed studies at the Illinois Institute of Technology and received a B.S. in Chemical Engineering in 1948. He was employed in 1948 by the chemical products division of Esso Standard Oil company until 1953, when he joined National Distillers' subsidiary, National Petro-Chemicals corporation, as senior technologist. Mr. Rader has performed customer service work, and as senior development engineer had charge of polyethylene development operations at the company's Tuscola plant.

Mr. Rader is a member of the American Institute of Chemical Engineers, the American Chemical Society, and the Society of Plastic Engineers.

Dr. Erich Meyer Appointed Vice President of Sonneborn

The appointment of Dr. Erich Meyer as vice president of L. Sonneborn Sons, Inc., was announced recently by R. S. Sonneborn, president.

Dr. Meyer moves up from the position of director, department of industrial research, and will continue to be responsible for Sonneborn's industrial research, acting as liaison between research, manufacturing and sales.

Dr. Meyer has served since 1926 with L. Sonneborn Sons, Inc., refiners and producers of "Amalie" brand automotive lubricants and greases, as well as waxes, white oils, petroleum sulfonates, petrolatum, and a line of building product specialties.

He began as a chemical engineer, but shortly thereafter was made superintendent of manufacture at Sonneborn's Petrolia, Pa., refinery. Later, in recognition of the importance of technical knowledge in the sale of its products, Sonneborn made Dr. Meyer responsible for its industrial research program, from which the present department of industrial research developed. He is the author of "White Oil and Petrolatum," the definitive book on the subject.

Dr. Meyer, who was born in Hanover, Germany, earned his doctorate at the University of Cologne. He is a Fellow of the American Institute of Chemists and a member of the American Chemical Society.

He lives in South Orange, New Jersey.

BRIGHT prospects—at the conclusion of a three-day sales meeting for Amalie division, L. Sonneborn Sons, Inc., Franklin, Pennsylvania, last month, executives are highly optimistic over 1958 prospects for Amalie Pennsylvania oils and greases. The meeting was attended by 28 Amalie sales representatives from all parts of the country. From left to right: C. H. Remmel, sales manager; R. Cubicciotti, vice president; William E. Hoyer, Sonneborn advertising manager.

United States Steel Promotes T. D. Brisson in National Tube Division

T. D. Brissman is appointed manager of sales, Houston district office of National Tube division, it was announced by Robert E. Williams, general manager of sales of this United States Steel corpora-

tion division. He succeeds the late James R. Boax.

Mr. Brissman returns to the office where he started his business career, all with National Tube, nineteen years ago. A native of St. Paul, Minn., Mr. Brissman is a graduate of the University of Minnesota in engineering. He was captain of the championship Big Ten baseball team there in 1937. He joined the U. S. Steel division as a salesman at Houston immediately upon graduation. The greater part of his work with National Tube has been in the Southwestern sales territory.

Starting in the Houston office in February, 1939, he transferred to San Antonio later that year as resident salesman serving South Texas and the Southern Gulf Coast. He entered the U. S. Army in 1941. After four years service, including 22 months of combat duty in the Pacific, he returned to National Tube in 1945 as resident salesman in Amarillo, serving the Texas Panhandle and South Plains, North Texas and Eastern New Mexico.

In April, 1953, Mr. Brissman was promoted to manager of claims of National Tube division with headquarters in Pittsburgh and in July, 1955, was made special representative, oil and gas industry, with headquarters in New York City, the position he held at the time of his Houston assignment.

American Metal Climax Consolidation in Effect

Consolidation of substantially all the oil activities of American Metal Climax, Inc., into a wholly-owned subsidiary, American Climax Petroleum corporation, was announced by Gay V. Land, vice president of the parent company who has been elected president of the subsidiary. In addition to Mr. Land, other operating officers of American Climax Petroleum corporation are Walter E. Long, vice president, and Wendell W. Barnes, controller and assistant treasurer.

Included in the consolidation are the oil and gas properties formerly owned by Climax Molybdenum company, The American Metal company, Limited, and those of Cobre Oil, Inc., and Blackwell Zinc company, Inc., subsidiaries of the American Metal company. American Metal and Climax Molybdenum were merged as American Metal Climax, Inc. at the end of 1957.

During the first six months of 1957 the combined interests of the predecessor companies in oil and gas production was in excess of 3300 barrels per day. Mr. Land

pointed out that by combining the separate strengths of the predecessor companies the resultant American Climax Petroleum corporation should become more important as a factor in the producing oil industry.

Dick Lee Named CCA Director

Richard P. Lee, 4001 Antioch Road, Kansas City North, has been named director of technical research for Consumers Cooperative association. He succeeds the late P. T. Naudet, under whom he worked as assistant director since 1953.

Native of Topeka, Kas., and graduate of the College of Emporia, Lee was a chemist with the National Refining company at Coffeyville, Kas., when that concern's refining operations were purchased by CCA in 1944. He taught mathematics and science in high schools at Luray and Miltonvale, Kas., before entering the industrial field. Lee has been NLGI Technical Representative for several years.

M. L. Carter Appointed Vice-President At Sowesco

Southwest Grease & Oil company, Inc., has announced the appointment of M. L. Carter as vice president in charge of research and production control.

Mr. Carter is a native Kansan, and was born in Smith Center, Kansas, October 5, 1909. He was graduated from Kansas State college in 1934 with a bachelor's degree in chemistry, and received his master's degree in 1941. Mr. Carter taught mathematics and science for eight years in Kansas high schools, going with Southwest in 1943 as chief chemist.

Officer Since 1948

In 1948, he was elected treasurer and a member of the board of directors of the company, acting in this capacity to the present date.

He is a member of the American Chemical Society, Society of Automotive Engineers, American Society of Lubrication Engineers, National Lubricating Grease Institute, Wichita Oil Men's club, Crestview Country club, and Hillside Christian church.

Air Suspension Chek-List Announced by Chek-Chart

Newest publication of the Chek-Chart corporation, "1958 Chek-Chart Air Suspension Chek-List," was announced by the publisher today.

The Air Suspension Chek-List is a handy tabulation of maintenance, hoisting and jacking, and towing instructions, covering the eleven makes of 1958 passenger cars which now offer this new system. Designed primarily for use as a wall chart, the new Chek-List is now available to petroleum marketers for distribution to their dealer organizations.

Should Have Data

All service stations have an urgent need for air suspension system data, according to Huntington Eldridge, president of the Chek-Chart corporation. "Air suspension systems offer the car owner many advantages," said Mr. Eldridge, "but they also offer the stationmen added problems. Certain specific instructions must be followed if the cars equipped with these systems are to handled correctly and safely.

"We have collected all the necessary information direct from individual car manufacturers and have produced a compact, easy-to-use tabulation to guide stationmen in handling cars equipped with air suspension systems. We believe this is the only publication of its kind available today."

The "1958 Chek-Chart Air Suspension Chek-List" clearly defines the various components of air suspension systems that must be serviced periodically. It describes the location of each service point, type of servicing required and it includes the service intervals recommended by each car manufacturer.

The new Chek-List is available in standard Chek-Chart format or it may be individualized with company name and trademark.

Industry News

Emery Industries Acquires Vopcolene Division

Emery Industries, Inc., announces the acquisition of the Vopcolene division of the Vegetable Oil Products company for an undisclosed sum. According to Mr. A. W. Schubert, executive vice president of Emery, the transaction will become effective April 1 and will include the entire property, production facilities, trademarks, etc., of the Vopcolene division in Los Angeles, California. No changes in personnel are contemplated and the operation, which will become the Vopcolene division of Emery Industries, Inc., will remain under the direction of Mr. Carl Williams, present general manager.

Currently the Vopcolene division is the only manufacturing plant on the West Coast producing a diversified line of fatty acids. Emery plans substantial expenditures for expansion and improvement of production facilities.

The new West Coast manufacturing point, coupled with Emery's main plant in Cincinnati, makes possible more effective and economic service to the trade.

As related by Mr. Schubert, this is the third major expansion by Emery in the last two years to keep pace with today's expanding industrial economy. The other two were acquisition of the fatty acid manufacturing facilities of the S. F. Lawrason and Company, Ltd., in London, Ontario, and the multi-million dollar joint venture with Monsanto Chemical company involving the construction of a new plant at Nitro, West Virginia, to fractionate tall oil into rosin and fatty acids.

With the near completion of both the Monsanto-Emery plant and the extensive modernization and expansion of the Canadian plant, this acquisition of the Vopcolene division will put Emery in a position to market a complete line of fatty acids and organic chemical derivatives throughout the entire United States and Canada.

Such products include vinyl plasticizers, special low-molecular weight acids, fatty esters, synthetic lubricant bases, textile chemicals, dibasic acids, fractionated tall acids, stearic and oleic acids, hy-

ter fractions, castor derivatives, fish fatty acids and glycerine.

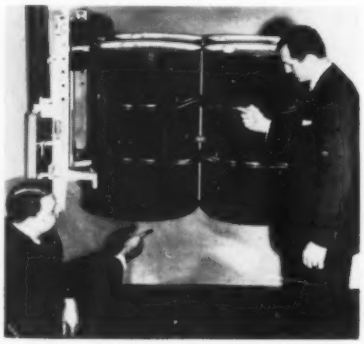
Design Unique Interlocking Rolling Hoops for Unitized 55 Gallon Steel Drums

A unique new 55 gallon steel drum which interlocks with adjacent containers when any number are unitized or packed closely together, has been developed as a means of saving space and reducing handling and shipping costs.

The key to the interlocking feature is the special design of the rolling hoops. These are slightly offset—alternately raised and lowered—on opposite sides of the drum. When unitized, a group of the new drums can be handled by a standard lift truck without the necessity of costly wood pallets.

This ingenious new drum was developed by the Signode Steel Strapping company in conjunction with Vulcan Containers Inc. of Bellwood, Ill., who will manufacture and market the new Uni-Drum container.

Transit damage can be sharply reduced because the unitized drums contact each other at their six strongest points, reducing denting and deformation. Also, the rotation, vertical movement and loosening which often results in scuffing and surface damage is minimized.



SPECIAL rolling hoops now allow interlocking with Vulcan's new Uni-Drum container, eliminating wood pallets.

The patented Uni-Drum containers cost no more than conventional 55 gallon drums, roll only on the hoops, therefore roll straight and can be guided easily, can be reconditioned, and can be readily intermixed with standard drums if necessary.

The drums are available with a variety of closures, accessories and fittings, sanitary and corrosion resistant linings and decorated to meet individual requirements.

For further information write Vulcan Containers Inc., P. O. Box 161, Bellwood, Illinois.

Carbide Introduces New Higher Organic Silicates

Two new higher organic silicates, tetra (2-ethylbutyl) silicate and tetra (2-ethylhexyl) silicate, are now being produced by Union Carbide Chemicals company, division of Union Carbide corporation. These compounds are suitable for formulating lubricants and hydraulic fluids because of their heat stability, good lubricity, and their fluidity over a wide temperature range. They also have good thermal properties, which recommend them for use as heat transfer media.

These organic silicates can be used in compounding synthetic lubricants and hydraulic fluids where mineral oils are not satisfactory. They have low viscosities at sub-zero temperatures, and in this respect, resemble silicones. But in addition, they have excellent lubricating qualities, which most silicones lack. Either silicate can be used alone, or mixed with the other to give physical properties intermediate between the two.

Both tetra (2-ethylbutyl) silicate and tetra (2-ethylhexyl) silicate are characterized by relatively high specific heat, low viscosity, and low volatility—all important properties of heat transfer fluids. Their outstanding advantages as heat exchange media are their complete fluidity over wide temperature ranges, and their suitability in processes that require both heating and cooling in the same equipment and with the same heat transfer fluid.

Both of these silicates have freezing points below minus 100 degrees Fahrenheit, and thus can be used in heat exchange equipment that may be exposed to severe winter temperatures. And either one may be chosen as the heat exchange fluid in processes like candy making, where heating followed by rapid cooling is essential. With either of these silicates as the heat transfer fluid, simultaneous draining of hot fluid and replacement with cold is possible. If another heat transfer fluid of greater volatility were used, it would be partially vaporized in such an application. This would make it necessary to pump against a pressure to introduce the cold fluid rapidly. Both silicates, when properly inhibited, are heat stable in closed systems up to 700 degrees Fahrenheit.

Savings in the design of high temperature equipment may be realized by specifying these silicates as heat transfer fluids, because high pressure equipment will not be required.

Carbide is in a position to produce other higher organic silicates and disiloxanes in addition to the two organic silicates just introduced. These related compounds have similar properties and potential value as functional fluids.

Both tetra (2-ethylbutyl) silicate and tetra (2-ethylhexyl) silicate are available in tank car quantities at a price of 65 cents per pound, f. o. b. South Charleston, West Virginia. Samples and technical information are available from Union Carbide Chemicals company, 30 East 42nd Street, New York 17, New York.

Dow Corning Appoints Canadian Distributor

Dow Corning Silicones, Ltd. has been appointed the Canadian distributor for the Alpha-Molykote corporation, Stamford, Conn., it was announced by David M. Noltie, vice president—sales. Noltie pointed out that Dow Corning's lubrication know-how will be of considerable value to Alpha-Molykote customers in Canada.

The Alpha Molykote corporation manufactures the well-known line of Molykote lubricants which features the use of the purest molybdenum disulfide commercially available.

Dow Corning Silicones, Ltd. is located in the Downsview section of Metropolitan Toronto, Ontario.

Add High-Speed Filler Machine to Girdler Process Equipment Line

Rights to a high-speed filler have been purchased by the Girdler process equipment division of National Cylinder Gas company from Librascope, Inc., Glendale, Calif.

John E. Slaughter, division president, said the machine will broaden the Girdler process equipment division's line of Votator continuous processing and heat transfer equipment used in the food, chemical and other industries. The new machine will be called the Votator Filler.

"This system makes it possible to combine processing and canning into one precise, faster and more sanitary operation with lower maintenance costs," Mr. Slaughter said.

Various models of the Votator Filler will be manufactured in Louisville and distributed through divisional offices in all parts of the United States and abroad, Mr. Slaughter said.

Everett Minard, inventor of the machine, will be employed as a full-time consultant, he said.

The filler machine packs liquids, viscous products such as citrus concentrates, crushed fruit, purees, soup, baby foods and jellies as well as petroleum products, anti-freeze, liquid detergents and many other canned products. It fills containers in a wide range of sizes and materials including glass, tin, aluminum and plastic at rates up to 1,000 containers per minute.

Both piston and gravity type fillers will be manufactured. Piston types will be available in sizes up to 36 stations for high-speed filling of containers from three-ounce to five-quart sizes. Gravity models will fill up to 425 containers per minute in containers of up to 46-ounce capacity.

Alemite CD-2 Concentrate Now Includes Phosphodyne

Alemite CD-2 Concentrate, an oil additive introduced to the automotive consumer market in 1953, and today unsurpassed in freeing sticky valves, rings, hydraulic valve lifters and in reducing friction and eliminating corrosion, now includes Phosphodyne, a surface agent that directly affects the lubricating oil film between rings and cylinder walls, the bearings and crankshafts and all parts lubricated by crankshaft oil.

The success of lubrication de-

pends upon establishing and maintaining an oil film between the pistons and cylinder walls.

Phosphodyne strengthens that oil film, according to Alemite people, who point out SAE tests have proven that Phosphodyne measurably increases the film strength of the oil so that it cannot, under any conceivable engine operating condition (short of running out of oil) rupture.

When the oil pressure is up, as in a running engine, the film thickness around these critical parts is adequate. However, when the engine stops, the oil drains leaving such vital areas virtually dry.

The most critical time, insofar as engine wear is concerned, occurs at the moment the engine is started. Because of Phosphodyne's film thickening ability, more oil is retained on the cylinder walls during engine idle.

Phosphodyne acts as a bonding agent, increasing the oil's affinity for metal which prevents draining when the engine is not running.

Alemite CD-2 with Phosphodyne is available at any garage, service station or other retail automotive outlet. It is distributed through Alemite's nation-wide distributing organization.

Energy's Role in Man's Progress Subject of New Film

Energy and its contribution to progress and better living is the subject of a new color animated film, "Energetically Yours," produced for the Standard Oil company (New Jersey) by Transfilm, New York, and now available to business and community organizations and schools on free-loan.

National premiered on Jersey Standard's 75th Anniversary show on network television in the late fall, "Energetically Yours" was designed by the noted British cartoonist-satirist Ronald Searle. It imparts, within its thirteen minutes, much of the significance of the development and use of the earth's energy sources and their contribution to man and his well-being. Throughout, however, there is Searle's lighthearted humor to entertain the viewer while it informs him.

Requests from business and community organizations and schools for free-loan 16mm prints of "Energetically Yours" should be directed to: Standard Oil Company (New Jersey), Room 1610, 30 Rockefeller Plaza, New York 20, N. Y.

GTA Library Announces Publication of Bulletin

The GTA library of product information has announced the publication of Bulletin TLP-57, on the new Gaulin "Twin-Lobe" rotary positive displacement pumps. It is part of the Gaulin technical assistance program which provides information and data on pumping and controlling materials with Gaulin particle control.

TLP-57 presents the features and operating characteristics of the recently developed Gaulin Twin-Lobe pump. Special emphasis is placed on a unique cosine rotor development called the Twin-Lobe design. It is said to have unusual simplicity and efficiency of operation, and is described and illustrated in detail. Twin-Lobe rotors are keyed to a rotating shaft and each of the lobes draws in a new volume of material with each 180 degrees of rotation, providing the positive displacement. The Cosine rotor principle provides a rate of delivery which is remarkably constant throughout the full range of discharge pressures. Only three moving parts are used.

The Gaulin Twin-Lobe principle also makes it possible to handle a wide range of products. These include light, non-lubricating liquids, heavy slurries and pastes, soft food solids, emulsions and gases.

NLGI Associate, Technical Members

CONTAINER AND CLOSURE MANUFACTURERS

American Can Company
4810 Belleview, Kansas City 12, Mo.
Representative—H. T. Rich

American Flange & Manufacturing Company, Inc.
30 Rockefeller Plaza, New York 20, N. Y.
Representative—Richard L. Parish, Jr.

Bennett Industries
Peotone, Illinois
Representative—S. A. Bennett

Central Can Company
2415 West 19th St., Chicago 8, Illinois
Representative—Henry Frazin

Cleveland Container Company
4925 So. Halsted St., Chicago 9, Ill.
Representative—R. D. Sayles

Continental Can Company, Inc.
100 East 42nd St., New York 17, N. Y.
Representative—W. J. Flint

Geuder, Paeschke & Frey Company
324 North Fifteenth St., Milwaukee 1, Wis.
Representative—Neil Savee

Inland Steel Container Company
6532 South Menard Ave., Chicago 38, Ill.
Representative—J. Daniel Ray

Jones & Laughlin Steel Corporation
Container Division
405 Lexington Ave., New York 17, N. Y.
Representative—C. K. Hubbard

National Steel Container Corp.
6700 South LeClaire Ave., Chicago 38, Ill.
Representative—Henry Rudy

The Ohio Corrugating Company
917 Roanoke Ave. S. E., Warren, Ohio
Representative—Lawrence F. McKay

Republic Steel Corporation
Container Division
465 Walnut Street, Niles, Ohio
Representative—Theodore Humphrey

Rheem Manufacturing Company
400 Park Ave., New York 22, New York
Representative—F. J. Blume

Rieke Metal Products Corporation
Auburn, Indiana
Representative—Mahlon E. Rieke

Steel Package Division of National Lead Company
722 Chestnut Street, St. Louis 1, Missouri
Representative—Warren T. Trask

United States Steel Products
Division, United States Steel Corporation
30 Rockefeller Plaza, New York 20, N.Y.
Representative—Wm. I. Hanrahan

Vulcan Containers, Inc.
P. O. Box 161, Bellwood, Illinois
Representative—L. M. Ferguson

ENGINEERING SERVICES

The C. W. Nofsinger Company
307 East 63rd Street, Kansas City 16, Missouri
Representative—C. W. Nofsinger

MANUFACTURERS OF EQUIPMENT FOR APPLICATION OF LUBRICATING GREASES

Balcrank, Inc.
Disney near Marburg, Cincinnati 9, Ohio
Representative—Richard P. Field

The Farval Corporation
3249 East 80th St., Cleveland, Ohio
Representative—Lee Witzenburg

Gray Company, Inc.
60 Northeast 11th Ave., Minneapolis 13, Minn.
Representative—B. A. Beaver

Lincoln Engineering Company
5701 Natural Bridge Ave., St. Louis 20, Mo.
Representative—G. A. Hubbard

Stewart-Warner Corporation
Alemite Division
1826 Diversey Parkway, Chicago 14, Illinois
Representative—E. G. Wicklatz

Trabon Engineering Corp.
28815 Aurora Rd., Solon, Ohio
Representative—E. W. Baumgardner

MARKETING ORGANIZATIONS

Ampol Petroleum, Ltd.
Buchanan Street
Balmain, New South Wales, Australia
Representative—L. Ashley

California-Texas Oil Company
380 Madison Ave., New York 17, New York
Representative—Hal U. Fisher

Canadian Petrofina Limited
505 Dorchester Street West
Montreal, Quebec, Canada
Representative—M. E. Wight

Cooperative GLF Exchange, Inc.
Terrace Hill, Ithaca, N. Y.
Representative—W. S. Miller

Denco Petroleum Company
5115 Denison Avenue, Cleveland 2, Ohio
Representative—I. L. Carmichael

D-X Sunray Oil Company
Mid-Continent Bldg., P.O.Box 381, Tulsa, Okla.
Representative—J. W. Basore

Farmer's Union Central Exch., Inc.
P. O. Box G, St. Paul 1, Minnesota
Representative—H. F. Wagner

Illinois Farm Supply Company
100 East Ohio Street, Chicago, Illinois
Representative—S. F. Graham

Ohio Farm Bureau Cooperative Association, Inc.
245 North High Street, Columbus 16, Ohio
Representative—Walter N. Callahan

Valvoline Oil Company
Division of Ashland Oil & Refining Co. Box G
Freedom, Pennsylvania
Representative—D. A. Smith

SUPPLIERS OF EQUIPMENT FOR MANUFACTURING LUBRICATING GREASES

Barrett Manufacturing Company
P. O. Box 8096, Houston 4, Texas
Representative—George J. Barrett, Jr.

Chemicolloid Laboratories, Inc.
55 Herricks Road, Garden City Park, N. Y.
Representative—David F. O'keefe

The Girdler Company
A Div. of National Cylinder Gas Co. Box 987
Louisville 1, Kentucky
Representative—J. E. Slaughter, Jr.

Manton-Gaulin Mfg. Co., Inc.
44 Garden Street
Everett 49, Massachusetts
Representative—G. W. Eldridge

Morehouse-Cowles, Inc.
1156 San Fernando Rd., Los Angeles, Calif.
Representative—George E. Missbach

NLGI Associate, Technical Members

Stratford Engineering Corporation
612 W. 47th Street, Kansas City 12, Missouri
Representative—D. H. Putney

Struthers Wells Corp.
1003 Pennsylvania Ave. West, Warren, Pa.
Representative—K. G. Timm

SUPPLIERS OF MATERIALS FOR MANUFACTURING LUBRICATING GREASES

Acme-Hardesty Company
60 East 42nd St., New York 17, N. Y.
Representative—W. C. Hardesty

American Cyanamid Company
30 Rockefeller Plaza, New York 20, N. Y.
Representative—B. H. Loper

American Potash & Chemical Corp.
99 Park Avenue, New York 16, N. Y.
Representative—W. F. O'Brien

Archer-Daniels-Midland Company
Chemical Products Division
P. O. Box 839, Minneapolis 2, Minn.
Representative—J. H. Kane

The Baker Castor Oil Company
120 Broadway, New York 5, New York
Representative—J. W. Hayes

Godfrey L. Cabot, Inc.
77 Franklin Street
Boston 10, Mass.
Representative—H. P. Donohue, Jr.

Climax Molybdenum Company
500 Fifth Ave., New York 36, New York
Representative—Elwin E. Smith

Darling & Company
4201 South Ashland Ave., Chicago 9, Illinois
Representative—G. W. Trainor

E. I. du Pont de Nemours & Co.
Wilmington, Delaware
Representative—R. O. Bender

The Elco Lubricant Corporation
Jennings Road & Denison Avenue
Cleveland 9, Ohio
Representative—R. K. Smith

Emery Industries, Inc.
4300 Carew Tower, Cincinnati 2, Ohio
Representative—G. W. Boyd

Enjay Company, Inc.
15 West 51st St., New York 19, New York
Representative—G. M. Hebert

Foote Mineral Company
18 W. Chelten Ave., Philadelphia 44, Penn.
Representative—W. F. Luckenbach

A. Gross and Company
295 Madison Avenue, New York 17, N. Y.
Representative—Eugene W. Adams

The C. P. Hall Company of Illinois
5145 West 67th St., Chicago 38, Illinois
Representative—J. E. Stonis

Harchem Division Wallace & Tiernan, Inc.
25 Main St., Belleville, N. J.
Representative—W. G. McLeod

The Humko Co. Chemical Dept.
P. O. Box 4607, 1702 N. Thomas St.
Memphis, Tennessee
Representative—W. J. O'Connell

Lithium Corporation of America, Inc.
Rand Tower, Minneapolis 2, Minnesota
Representative—Malcolm M. Moore

The Lubrizol Corporation
Box 3057—Euclid Station, Cleveland 17, Ohio
Representative—J. L. Palmer

Mallinckrodt Chemical Works
2nd & Mallinckrodt Sts., St. Louis 7, Missouri
Representative—D. B. Batchelor

The McGean Chemical Corp.
Midland Building, 101 Prospect Ave., N. W.
Cleveland 15, Ohio
Representative—W. A. Ritchie

Metasap Chemical Corporation
Harrison, New Jersey
Representative—O. F. Lohrke

Monsanto Chemical Company
800 North Twelfth Blvd., St. Louis 1, Mo.
Representative—J. W. Newcombe

National Lead Company
Baroid Sales Div., 111 Broadway, N.Y. 5, N.Y.
Representative—H. H. Farnham

Newridge Chemical Company
7025 West 66th Place, Chicago 38, Illinois
Representative—T. E. Shine

M. W. Parsons—Plymouth, Inc.
59 Beekman St., New York City 38, New York
Representative—Herbert Bye

Synthetic Products Company
1636 Wayside Rd., Cleveland 12, Ohio
Representative—Garry B. Curtiss

Swift & Company
165th & Indianapolis Blvd., Hammond, Ind.
Representative—F. H. Beneker

Vegetable Oil Products Co., Inc.
Vopcolene Division
5568 East 61st Street, Los Angeles 22, Calif.
Representative—C. F. Williams

Witco Chemical Company
122 East 42nd St., New York 17, New York
Representative—E. F. Wagner

TECHNICAL AND RESEARCH ORGANIZATIONS

American Lithium Institute, Inc.
P. O. Box 549,
Princeton, New Jersey
Representative—Marshall Sittig

Battelle Memorial Institute
505 King Avenue, Columbus 1, Ohio
Representative—S. L. Cosgrove

Compagnie Francaise De Raffinage
11 Rue du Dr. Lancereaux, Paris VIII^{e}, France
Representative—Albert E. Miller

Inland Testing Laboratories
6401 Oakton St., Morton Grove, Ill.
Representative—Dr. Morton Fainman

Institut Francais du Petrole
CMrR—Courtel, 4 Place Bir Hackeim
Rueil—Malmaison (S. et Oise) France

Laboratoires de Recherches Purfina S.A.
98/100 Chaussee de Vilvorde,
Bruxelles (N.O.H.), Belgium
Representative—R. Gillerot

Petroleum Educational Institute
9020 Melrose Avenue, Los Angeles 46, Calif.
Representative—G. A. Zamboni

Phoenix Chemical Laboratory, Inc.
3953 W. Shakespeare Ave., Chicago 47, Ill.
Representative—Mrs. G. A. Krawetz

Products Development Laboratory
1 Market St., West Warwick, Rhode Island
Representative—Alberic T. DiMasi

Du Pont Academic Grants

Grants totaling nearly $1,150,000 have been awarded to 135 universities and colleges in Du Pont's annual program of aid to education, the company announced. The total for the next academic year is about $100,000 more than Du Pont contributed for this school year.

Most of the increase and more than half of the entire program are grants to colleges and universities for strengthening the education of scientists and engineers. These grants will support the teaching of science and mathematics as well as other subjects. At the same time, grants for fundamental research are being continued, as are grants for fellowships, which once made up the entire plan. Du Pont's program dates from 1918.

As in previous years, decisions on the use of the funds and the selection of people to receive individual grants are left to the institutions.

In recent years, discussions with educators have indicated that maintaining high standards of teaching is a major problem at all levels of education in view of higher costs and increasing enrollments. Du Pont's grants for advancing teaching, which proved effective in science, mathematics, and other liberal arts courses, are now being extended to medical schools for the first time.

API—Bureau of Census, 1956 Sales Survey Available

The long-waited survey for 1956 of lubricating oil and grease sales sponsored by the Lubrication committee, Division of Marketing, American Petroleum Institute, and conducted by the United States Bureau of the Census, Department of Commerce, was released January 31, 1958.

One of the Commerce department's "Facts for Industry" series, the survey is entitled "Sales of Lubricating Oils and Greases, by States, Types and Company Classification: 1956." The ten-page booklet was prepared by the Bureau of the Census, Industry Division, Chemicals branch.

This is the third national survey of sales of lubricating oils and greases by states, and by types . . . other surveys were made by the bureau in 1947 and in 1951. Contained in the report are seven extensive tables which give sales of lubricating oils and greases by districts, types and company classifications . . . by states and types . . . by percentages of U. S. totals. Other tables show the sales of automotive lubricating oils and greases by states and company classification . . . sales of industrial oils, by states and company classifications . . . sales of industrial greases by states and company classification . . . and the number of companies reporting sales of lubricating oils and greases by states and by company classification.

(Although most member firms of the NLGI cooperated in the Census survey, it should not be confused with the current NLGI survey on *production* for 1957, currently being conducted.)

The Census survey is for sale at ten cents a copy by writing the Bureau, Washington 25, D. C. The report is Series M29C-06.

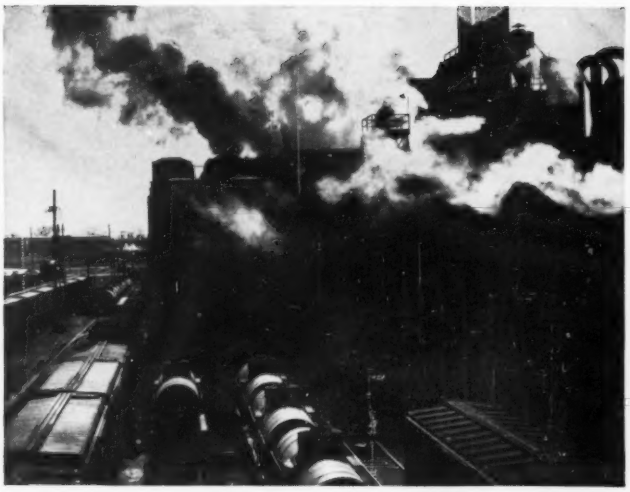
Gear Lubricant Information In New API Bulletin

Publication of a new bulletin, "Precautionary Labels," was announced by the Department of Technical Services, of the American Petroleum Institute.

Prepared by the interdivisional committee on labeling, under the chairmanship of M. D. Gjerde, of the Standard Oil company (Indiana), this publication is known as API Bulletin 2511.

The bulletin defines the terms and gives instructions for the preparation of petroleum warning labels. A discussion of label content as well as fifteen specimen labels for Benzene, petroleum cutting oil, gear lubricants containing volatile chlorinated hydro-carbons, leaded, unleaded and pump dispersing gasoline, kerosine, aromatic naphthas, petroleum naphthas, toluene, and xylene are included in the publication.

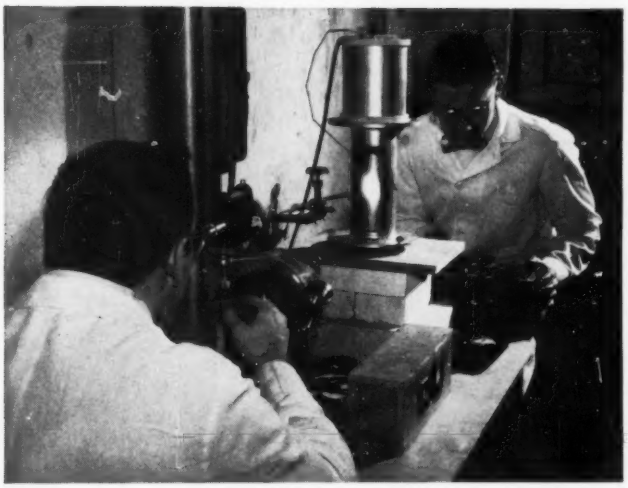
Copies are available through the API at 50 West 50th, at one dollar each, with discounts on bulk orders.



Hydroxide-
Monohydrate
Carbonate
Chloride
Fluoride
Bromide
Hydride
Stearate
Citrate
. . . and the
metal

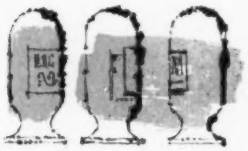
Available in
Commercial Quantities

FOOTE LITHIUM COMPOUNDS



Butyl
Propyl
Perchlorate
Diphenyl
Nitrate
Oxide
Sulfite
Borate
Sulfate
Chromate
Molybdate

Available in
Experimental Quantities



Get lithium in the compounds you need . . . the compounds you find most useful in your product or process. New and broader applications have put many of these compounds on a *high production basis*. So don't let any misgivings about availability deter you from making full use of these important, relatively new chemical forces. Check the lists above for the availability of the particular lithium compounds you are most interested in. If you don't find them, check with us . . . we'll do our best to satisfy any reasonable request concerning lithium compounds. And for the latest in lithium technical data, be sure to send for your copy of "Chemical and Physical Properties of Lithium Compounds"—an earthy collection of facts and figures on some 23 compounds. Address request to the Technical Literature Section, Foote Mineral Company, 402 Eighteen West Chelten Building, Philadelphia 44, Pa.

Foote
MINERAL COMPANY

LITHIUM METAL, CHEMICALS, MINERALS • STRONTIUM CHEMICALS • WELDING GRADE FERRO ALLOYS • ELECTROLYTIC MANGANESE METAL • STEEL ADDITIVES • COMMERCIAL MINERALS AND ORES • ZIRCONIUM, TITANIUM, HAFNIUM (IODIDE PROCESS)

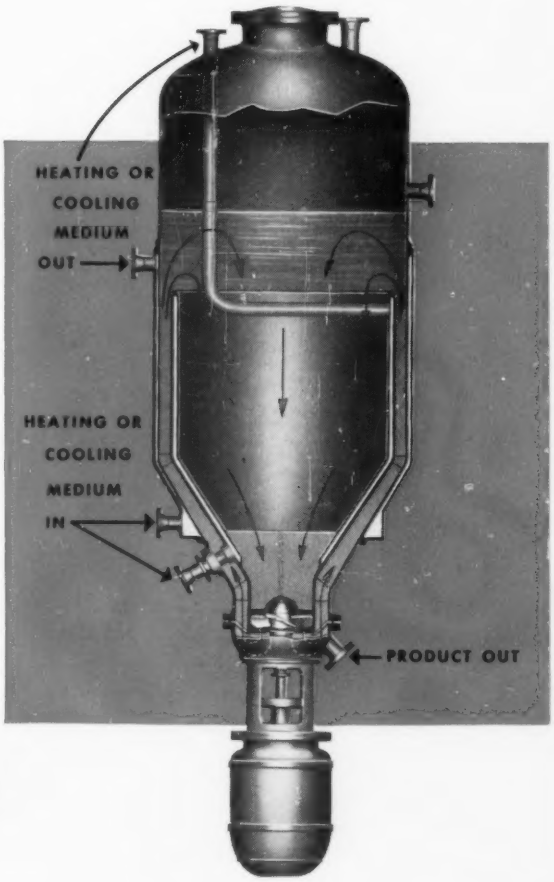
NEW Markets for You...

In the Special Formula Greases You Can Make With

STRATCO GREASE CONTACTORS

Stratco Contactors not only make standard greases faster, better and more economically but also make special formula greases to exact specifications.

Too often you can't make these greases profitably with ordinary equipment . . . but with a Stratco you can. Contact us for details.



MADE TO EXACT SPECIFICATIONS with STRATCO Reg. U. S. Pat. Off.

GREASE CONTACTORS

STRATFORD ENGINEERING Corporation

612 West 47th St. — *PETROLEUM REFINING ENGINEERS* — Kansas City 12, Mo.